ATTACHMENT 1.

OPERATION & MAINTENANCE MANUAL
OIL/WATER SEPARATOR SYSTEM

ARIZONA ARMY NATIONAL GUARD FACILITY
1614 WEST ROOSEVELT STREET
PHOENIX, ARIZONA

Prepared for

Arizona Army National Guard
5636 East McDowell Road
Bldg. M5330
Phoenix, Arizona 85008-3495

Prepared by

IT Corporation
4114 East Wood Street, Suite 100
Phoenix, Arizona 85040

Project 812702

CONTENTS

Figures

Appendices

1 INTRODUCTION

1.1 Introduction and Purpose

The oil/water separator (OWS) system is designed to remove oil and grease constituents from process water generated at the Roosevelt Arizona Army National Guard Facility. The Roosevelt facility is located at 1614 West Roosevelt Street in Phoenix, Arizona. The system processes water generated from vehicle-washing activities conducted at the wash pad area as well as water generated from washing the concrete floors in the maintenance bays at the facility. The purpose of this document is to assist the OWS system operator in understanding the function of the system, its components and the steps necessary to properly maintain the system for optimal performance.

The primary objective for the OWS system is to prevent discharge of oil and grease constituents greater than 15 parts per million into the City of Phoenix sewer system. To accomplish this task, the OWS system is designed to trap liquid phase hydrocarbons (LPH) recovered from the process stream in an internal receiver. The OWS system is also equipped with an automated LPH transfer system which will remove the recovered LPH from the OWS system's internal receiver to a storage container pending proper disposal.

The purpose of this manual is provide additional information with regard to system components and provide a routine schedule of operation and maintenance tasks. This manual has been prepared under the assumption that the operator of the system has a basic understanding of OWS systems. This manual is not intended for extensive troubleshooting or invasive system repairs. IT recommends that such troubleshooting or repairs be performed by a qualified specialist. Contact information has been provided in this manual as a guide to locating qualified assistance with the system. In addition, appropriate health and safety procedures should be followed at all times while operating or maintaining the system.

1.2 System Management Information

Owner:	Arizona Army National Guard 5636 E McDowell Road Bldg M5330 Phoenix, AZ 85008-3495 Contact: Dave Annis	(602) 267-2974
Design Consultant:	IT Corporation 4114 East Wood St., Suite 100 Phoenix, AZ 85040 Contact: Duncan Aepli	(602) 470-0444
System Supplier:	Highland Tank One Highland Road Stoystown, PA 15563 Contact: Mike Sarver	(814) 893-5701
Permit Agency:	City of Phoenix, Pollution Control Department 200 West Jefferson, 3rd Floor Phoenix, AZ Contact: Phil Kaiser	(602) 495-0278

2 SYSTEM DESCRIPTION

The OWS system at Roosevelt is comprised of two primary components; the underground interceptor tank (UIT) and the aboveground Oil/Water Separator (AOWS) as well as several secondary components; a diaphragm pump, various float sensors, control panel, and a liquid phase hydrocarbon (LPH) transfer pump. Process waste water treated by the system is generated in two locations at the facility; at the vehicle wash station and in the maintenance shop. Process water generated from vehicle-washing activities is initially processed through two existing sand traps contained within the bermed wash pad area at the site. The purpose of these traps is to remove coarse grained particulate matter from the waste stream prior to reaching the OWS system. After exiting the sand traps, this wash water is then gravity-fed through four-inch vetrified pipe into the OWS system via an underground interceptor tank (UIT). Process waste water generated from washing shop floors in the maintenance bays at the facility also gravity drain into the OWS system via the UIT. The UIT is equipped with a baffle to trap any residual heavy particulates in the waste stream. Once water reaches a specific level within the UIT, a float sensor activates the air-operated diaphragm pump and removes water and LPH from the UIT to the aboveground oil/water separator (AOWS). The air-operated diaphragm pump is located inside the concrete retention pad next to the AOWS.

Within the AOWS, the waste stream is passed through a series of chambers designed to separate, recover and hold LPH pending transfer out of the system. The AOWS is designed to remove oil and grease constituents down to below 15 parts per million. Process water accumulates beneath the recovered LPH in the reservoir chamber and periodically gravity drains into the City of Phoenix sewer system by siphon affect. As LPH accumulates in the chamber, the LPH depresses an oil float switch positioned at the oil/water interface. Once the oil float switch is depressed approximately one inch from its static position (at approximately 20% of the oil/water separator volume), the switch activates an air-operated transfer pump and the LPH is pumped out of the AOWS into a 55-gallon drum for storage pending disposal. The OWS system is designed for unattended, continuous operation and equipped with an alarm to announce occurrence of certain conditions. The alarm conditions are outlined in subsequent sections of this manual. Periodic system inspections and maintenance should be adequate to maintain the system. The following sections provide additional details for components of the system and their associated maintenance.

2.1 Underground Interceptor Tank

The UIT has the following specifications:

Supplier:	Highland Tank
Manufacturer:	Highland Tank
Capacity:	550-Gallons
Dimensions:	4-foot Diameter by 6-feet Long
Construction:	7-Gauge mild carbon steel.
Coating:	Exterior – Corrocote Plus (15 mils) Interior – Corrocote PW (15 mils)
Modifications:	1) A 3-inch NPT fitting was added at the top of the tank. 2) A 2-inch heavy-duty suction hose was inserted in the 4-inch outlet pipe.
Depth To Bottom:	7.88 feet or 94.5 inches (measured from the mark on the PVC riser)

Please refer to Appendix A for interior dimensions and additional details.

2.2 Aboveground Oil/Water Separator

The AOWS has the following specifications:

Supplier:	Highland Tank
Manufacturer:	Highland Tank
Model No.:	R-HT 600
Capacity:	600-Gallons
Dimensions:	3-foot Wide by 9-feet Long by 3-foot High
Construction:	7-Gauge mild carbon steel.
Coating:	Exterior – Epoxy/Urethane White Paint (3 mils) Interior – Corrocote PW (15 mils)
Modifications:	None
Depth To Bottom:	3.11 feet or 37.5 inches (measured from the mark on the four inch cleanout)

Please refer to Appendix B for interior dimensions and additional details.

2.3 Diaphragm Water Pump

The diaphragm pump has the following specifications:

Supplier:	Highland Tank
Manufacturer:	Ingersoll Rand
Model No.:	ARO Pump 666150-344-C
Flow Rating:	50-gallons per minute (max)
Pressure Rating:	120 pounds per square inch (max)

Inlet/Outlet:	1 ½-inch Diameter
Construction:	Aluminum, with Teflon Ball and Diaphragm material, and Polypropylene Seat material.

Please refer to Appendix C for additional details.

2.4 Float Sensors

There are a total of four float sensors equipped on the OWS system at this site. Three water-type float sensors are installed in the UIT. The fourth is an oil-type float sensor installed in the AOWS. The following subsections provide additional information about these sensors. Please refer to Appendix D for additional details.

2.4.1 Water Float Sensors

The three water float sensors in the UIT have the following specifications:

Supplier:	Highland Tank
Manufacturer:	SJE-Rhombus Controls
Model No.:	Super Single Pump Switch (1001975)
Voltage Rating:	120 – 240V
Usage:	Suitable for usage with intrinsically-safe circuits

The function and placement of the three water float sensors are as follows:

- **Low-Level (Pump Off):** Located in the 18-inch diameter manway on the UIT. When activated, this sensor sends a signal to the control panel (described in Section 2.5) to shut off the pump. This sensor is set to activate when the water level in the UIT is approximately eight inches from the bottom.

- **High-Level (Pump On):** Located in the 36-inch diameter manway on the UIT. When activated, this sensor sends a signal to the control panel to start the diaphragm pump. This sensor is set to activate when the water level in the UIT is approximately 34 inches from the bottom.

- **High-High-Level (Pump On):** Located in the 36-inch diameter manway on the UIT. When activated, this sensor sends a signal to the control panel to activate the alarm and a red light. The purpose of this alarm is to notify the operator that the High-Level (Pump On) sensor or pump is malfunctioning. The High-High-Level sensor is set to activate when the water level in the UIT is approximately 37 inches from the bottom.

2.4.2 Oil Float Sensors

The oil float sensor has the following specifications:

Supplier:	Highland Tank
Manufacturer:	Highland Tank
Model No.:	HTFOE
Voltage Rating:	120 – 240V
Usage:	Suitable for usage with intrinsically-safe circuits

The oil float sensor is located in the AOWS. Its placement is pre-set by the factory at approximately 14-inches from the top of the AOWS unit, or, six inches below the fluid level in the separator. This setting is design to activate the sensor when oil reaches approximately 20% of the total capacity of the oil/water separator (approximately 120 gallons of oil).

This sensor is designed to float on water and sink in oil. Therefore, under normal operation (submerged in water), the float is at the top of the float stem. As oil accumulates, the sensor sinks to the bottom of the stem. When at the bottom of the stem, the sensor sends a signal to the control panel, which in turn activates the transfer pump (described in Section 2.6). In addition, this sensor will also activate an alarm (horn and light) on the control panel to announce that product transfer is in progress.

2.5 Control Panel

The intrinsically-safe control panel has the following specifications:

Supplier:	Highland Tank
Manufacturer:	Warrick Controls
Model No.:	Series 67
Voltage Rating:	120 -- 240V
Usage:	Nema4 Weather-Proof, Intrinsically-safe application

Please refer to Appendix E for additional details.

The control panel has the following components/features:

- **ON/OFF/AUTO** Modes: These modes control the operation of the diaphragm air pump. Under normal operation of the system, the control mode would be in the AUTO position. The ON position is to bypass the AUTO mode and would operate the pump regardless of the water level in the UIT. The OFF position would deactivate the pump regardless of the water level in the UIT.

- **Pump On (Green Light):** This is an indicator that the system is operating properly.

- **Alarm (Horn and Red Light):** This alarm is activated if the water level reaches the High-High-Level in the UIT, or, the oil-level sensor in the AOWS separator is engaged and the LPH transfer system is operational.

- **Silence:** This button is used to acknowledge and silence any alarm condition.

The control panel is equipped with a solenoid valve, an in-line air filter, and a pressure regulator to control the flow of air to the diaphragm pump. A second panel, installed north of the diaphragm pump control panel and equipped with a solenoid valve, an in-line air filter and pressure regulator, provides air flow to the LPH Transfer system.

2.6 LPH Transfer System

An automated LPH transfer system is installed to transfer recovered LPH from the AOWS to a storage container pending disposal. An air-operated pump has been mounted on the AOWS. When the oil-level float sensor is activated, the pump will transfer LPH (by activating a time-delay relay and opening of a solenoid valve) for a pre-determined (pre-set) time period into a 55-gallon storage drum. The LPH transfer will occur via petroleum rated hose connecting the AOWS to the storage drum. The alarm will sound while the transfer pump is operational. This alarm is to signal the operator that a replacement drum will be required at the completion of the LPH transfer. In addition, the LPH storage drum should be gauged for liquids using an interface probe every month. If any liquid is present, the drum should be emptied or replaced. The solenoid valve, a pressure regulator, and an in-line air filter are located inside a weather-proof panel located north of the main control panel. The following specifications of the components of the LPH transfer system:

Oil Pump:

Supplier:	Grainger
Manufacturer:	ARO
Model No.:	4P971
Flow Rating:	0-3 gallons per minute
Pressure Rating:	100 pounds per square inch (max)
Inlet/Outlet:	3/8 / 1/4-inch Diameter
Construction:	Polypropylene w/ Teflon diaphragm.

Please refer to Appendix F for additional details.

3 START-UP PROCEDURES

3.1 System Start-Up

Refer to Highland Tank user's manual (pages 21 and 22) found in Appendix G for start-up details of the OWS system. **Note:** ***The OWS system must be filled with clean water prior to pumping process water into the separator. This must be done every time the Oil/Water Separator is emptied for cleaning purposes. The alarm will sound until the system is filled with an appropriate level of water.***

4 SYSTEM MAINTENANCE

Periodic inspection and maintenance is required to ensure successful long term operation of the system. The following sections summarize standard maintenance and monitoring procedures for the system.

4.1 Underground Interceptor Tank

4.1.1 Sediment Accumulation

The UIT is the primary component of the system for accumulation of coarse grain sediment in the process stream. Sediment measurements can be performed by accessing the 36-inch vault on the UIT. A three inch PVC riser is located within the vault. Remove the cap from the PVC riser and locate the red mark on the north side of the PVC.

Depth to bottom of the UIT, as measured from the red mark: **94.5 inches or 7.88 feet.**

The sediment thickness should be measured initially on a ***weekly*** basis by carefully inserting a measuring device (interface probe, measuring tape or ruled wooden pole) through the three inch riser to the bottom of the UIT. When a sediment accumulation of 12 inches is observed by measurement of the tank, the UIT must be emptied and rinsed.

Depth to sediment in the UIT indicating cleanout needed: **82.5 inches or 6.88 feet.**

The frequency of sediment measurements can be adjusted by the operator based on actual sediment accumulating rates observed during the first year of operation.

4.1.2 Maintenance

The following precautions should be considered when removing loose sediment from the UIT:

- Turn the control for the diaphragm pump to the OFF position.
- Access the 36-inch diameter vault on the UIT. Carefully insert a suction hose down the three inch riser to the sediment water interface and begin to remove the accumulation. Use caution when removing the sediment to avoid damage to tank's internal coating.

- Following UIT cleanout, turn the control to the AUTO position to activate the diaphragm pump and fill the UIT with clean water until the sensor activates the pump and the alarm is silenced.

Over a period of time, sediment, oil and grease will build up on the walls of the UIT. The manufacturer recommends that the interior be cleaned a minimum of once a year to ensure optimal performance. After removing loose sediment using the procedure outlined above, remeasure depth to bottom to determine if packed sediment is present. The following steps should be taken to remove packed sediment:

- Turn the control for the diaphragm pump to the OFF position.
- Disconnect all non-voltage carrying sensor lines to the high level and high-high level sensors.
- Carefully remove the all three sensors and inspect the floats for free operation. Store the sensors in a safe location to prevent damage during tank cleanout.
- Remove the 24-inch tank manway cover on the UIT, being careful not to damage the gasket.
- Using a wand extension, insert a high pressure hose downward through the manway and direct the spray at the interior walls of the tank to loosen caked oily solids. **Do not enter the UIT under any condition without proper confined space training and OSHA approved equipment (Consult OSHA guidelines 29 CFR, Part 1910.146).**
- Suction the resulting slurry out of the tank.
- Reseal the tank manway and seal. Reinstall the sensors.
- Following UIT cleanout, turn the control to the AUTO position to activate the diaphragm pump and fill the UIT with clean water until the sensor activates the pump.

4.2 Aboveground Oil/Water Separator

Detailed maintenance procedures for the AOWS are provided on pages 31 through 36 of the Highland Tank User' s Manual (Appendix G). Please reference the manufacturer recommended maintenance and warnings. At a minimum, the AOWS should be inspected as follows:

Monthly Basis:

- The LPH storage drum should be gauged by carefully inserting a measuring device (interface probe, measuring tape or ruled wooden pole) into drum bung. If any liquid is present, replace or empty the drum.

Quarterly Basis (Every 3 months):

- Although retarded by the UIT, sediment accumulation may occur in the AOWS. Check the AOWS for sediment/sludge accumulation using the method outlined in Section 4.1.1 of this manual or as outlined on Page 34 of the Highland Tank User' s Manual. Sediment/Sludge thickness should not exceed 12 inches. If the thickness is greater than 12 inches, the sediment/sludge should be removed from the AOWS. A measuring point has been indicated on top of the AOWS.

  Depth to bottom of the AOWS, as measured from the red mark: **37.5 inches or 3.11 feet**

  Depth to sediment in the AOWS indicating cleanout needed: **25.5 inches or 2.11 feet**

- Measure LPH thickness using an interface probe. LPH thickness should not exceed seven inches as measured at the four inch access point on the AOWS. If the thickness is greater than seven inches, the oil sensor is malfunctioning and would require repair or replacement. In addition, the oil must be pumped manually following procedures outlined on Page 32 of the User' s Manual.

- Inspect the condition of oil float sensor to ensure proper (free) movement of the float. This can be done by removing the oil sensor (2-inch fitting) or testing in place. If removed from water, the float will be resting at the bottom of the float stem. This should activate the alarm and transfer pump. When the float sensor is inserted back into the separator (submerged in water), the alarm should deactivate. If tested in place, depress the float approximately one inch by applying gentle hand pressure. This should activate the alarm and the transfer pump.

Annual Basis:

In accordance to the Manufacturer recommendations, the AOWS should be emptied of all liquids, sludges and solids and cleaned once a year as outlined on pages 32 through 36 of the Highland Tank User' s Manual. Specific components to be cleaned include: Sediment Chamber; Oil/Water Separator Chamber; and, Petro-Screen Coalecer.

Accidental Oil Spill:

Should an oil spill at the facility enter the process stream, refer to procedures outlined on Page 33 of the Highland Tank User' s Manual as well as procedures documented in the facility Spill Control Plan and/or Emergency Response Plan. The Spill Coordinator for the Roosevelt facility is Tim McCue at (602) 267-2449.

5 SYSTEM TROUBLESHOOTING

A list of the most common problems, their possible causes and suggested remedies are listed on page 37 of the Highland Tank User' s Manual. However, this manual is not intended for extensive troubleshooting or invasive system repairs. IT recommends that such troubleshooting or repairs be performed by a qualified specialist.

6 LIMITATIONS

The services described in this report were performed consistently with generally accepted professional consulting principles and practices. No other warranty, expressed or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance of this report by a third party is at such party's risk.

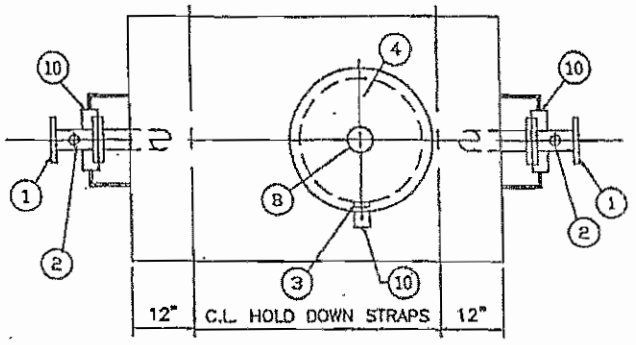
Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

APPENDIX A
INTERCEPTOR TANK DETAILS

GENERAL SPECIFICATIONS

NO. REQ'D: (1)
CAPACITY: 550 GALLONS
TYPE: UNDERGROUND, SINGLE WALL, SINGLE BASIN INTERCEPTOR TANK
MATERIAL: MILD CARBON STEEL
FLOW RATE: 55 GPM
GAUGE: INNER
SHELL– 7 GA.
HEADS– 7 GA.
SURFACE PREP:
SSPC NO.6 BLAST ALL EXTERIOR SURFACES
SSPC NO.10 BLAST ALL INTERIOR SURFACES

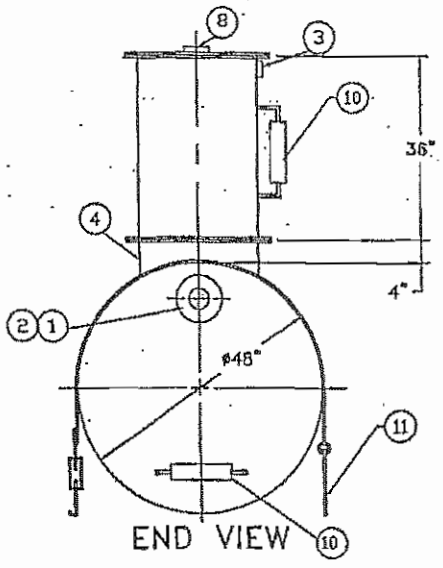
COATING:	MATERIAL	THICKNESS
EXTERIOR–	CORROCOTE PLUS	(15 MILS)
INTERIOR–	CORROCOTE PW	(15 MILS)



PLAN

PROVIDED EQUIPMENT

1. 150# R.F.S.O. FLANGE
2. ISOLATED SPOOL PIECE W/ 2" NPT (VENT)
3. 3"ø NPT W/ 3" x 2" NYLON BUSHING (FTG. FOR VENT)
4. 24" ø MANHOLE W/ BOLT ON EXTENSION SHIPPED LOOSE
5. 4" ø ELBOW
6. STRIKER PLATES
7. SLUDGE BAFFLE
8. 5"ø NPT W/ 5" x 4" NYLON BUSHING FTG. FOR GAUGE
9. OUTLET DOWNCOMER
10. SACRAFICIAL ANODES PER STIP3 SPECS
11. NYLON HOLD DOWN STRAP WITH GALVANIZED TURNBUCKLE WIRE ROPE & CLAMPS



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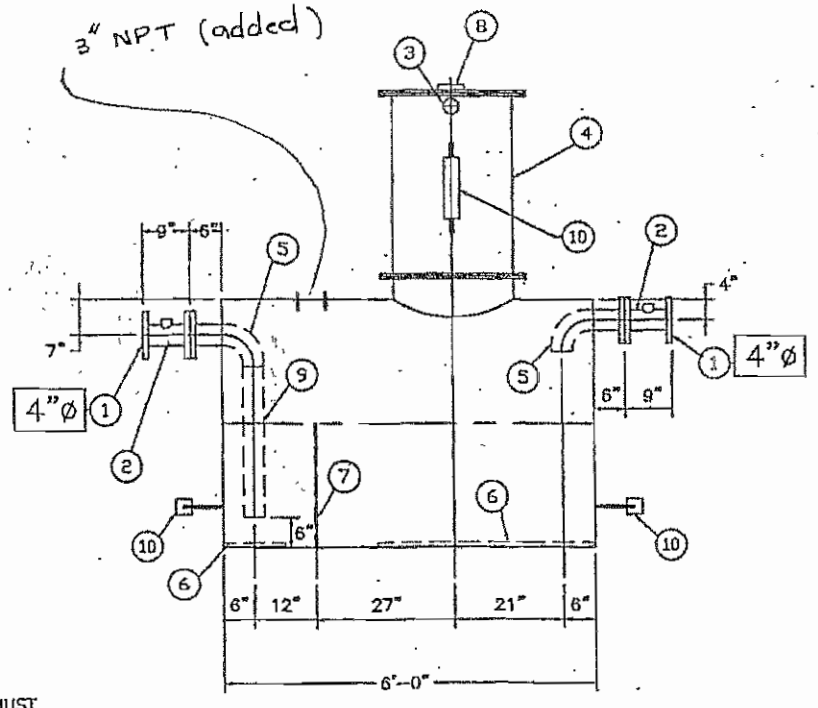


ELEVATION

Fabrication Will Not Begin Until Approved Drawing is Received By Highland Tank

REVISIONS

Highland Tank

550 GALLON SINGLE BASIN INTERCEPTOR TANK

CUSTOMER: OCTAGON SERVICES INC.

PROJECT: IT CORP. ARMY NATIONAL GUARD PHOENIX, AZ.

QUOTE NO: 66651

SCALE:	DATE:	DWG. BY:	CHK'D BY	DWG. NO.:
1/2"=1'-0"	12-14-00	REM		001214 R-

APPENDIX B
OIL/WATER SEPARATOR DETAILS

Highland Rectangular Oil/Water Separators

Highland Tank

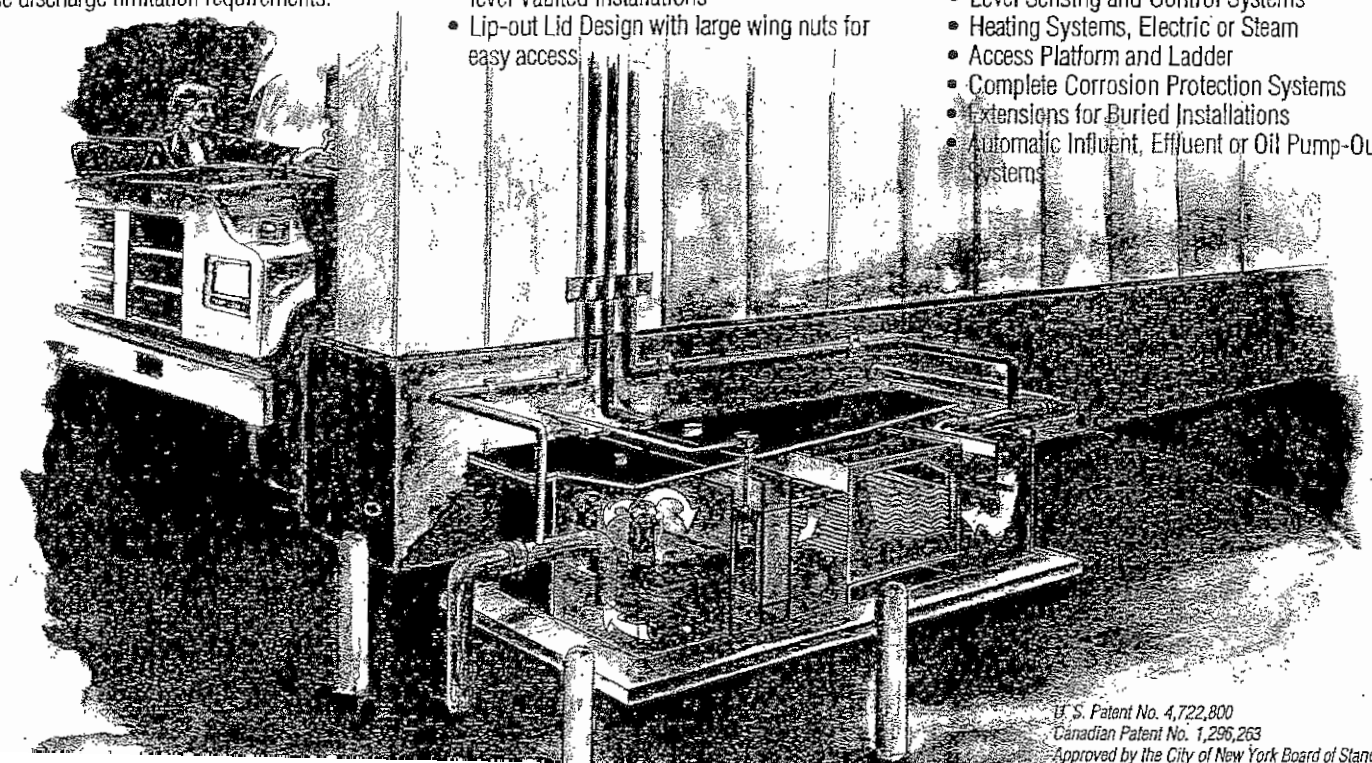
Model	Nominal Capacity (Gallons)	Spill Capacity (Gallons)	Flow Rate (gpm)	Dimensions L x W x H	Inlet/Outlet Diameter	Approximate Wt. (lbs.)
R-HT or R-HTC 100	100	40	5	4'0" x 1'6" x 3'0"	1"	650
R-HT or R-HTC 200	200	80	10	5'4" x 2'4" x 3'0"	2"	975
R-HT or R-HTC 300	300	100	25	7'4" x 2'4" x 3'0"	3"	1,150
R-HT or R-HTC 600	600	200	50	9'4" x 3'4" x 3'0"	4"	1,850
R-HT or R-HTC 900	900	300	75	10'4" x 3'4" x 4'0"	6"	2,145
R-HT or R-HTC 1,000	1,000	400	100	11'4" x 4'4" x 4'0"	6"	4,380
R-HT or R-HTC 2,000	2,000	750	200	12'4" x 5'4" x 5'0"	8"	7,150
R-HT or R-HTC 3,000	3,000	900	300	16'0" x 5'0" x 5'0"	10"	8,375
R-HT or R-HTC 4,000	4,000	1200	400	16'0" x 6'0" x 5'0"	10"	8,844
R-HT or R-HTC 5,000	5,000	1500	500	20'0" x 6'0" x 6'0"	10"	9,825

Weights listed are for HTC models. Contact Highland for all other weights. Plate spacing and orientation may vary depending on site conditions.

Highland Rectangular Oil/Water Separators
Highland Tank Rectangular Oil/Water Separators are designed for the removal of free floating oil, grease, and settleable oily coated solids from oil-water mixtures. These separators incorporate Highland's patented means of primary separation and meet or exceed federal, state and local oil and grease discharge limitation requirements.

Standard Features
- High-Performance
- Unsurpassed Quality
- Rugged All-Steel Vessel Construction
- Removable Vapor-tight Top Covers for service and maintenance
- Above-ground and Below-ground or Grade-level Vaulted Installations
- Lip-out Lid Design with large wing nuts for easy access

Options
- Double-wall Construction
- Special Internal and External Coatings
- I-Beam Saddles or Skids
- Integral Sludge and Oil Compartments
- Gravity Oil Skimmer
- Sludge Hopper
- Level Sensing and Control Systems
- Heating Systems, Electric or Steam
- Access Platform and Ladder
- Complete Corrosion Protection Systems
- Extensions for Buried Installations
- Automatic Influent, Effluent or Oil Pump-Out Systems



U.S. Patent No. 4,722,800
Canadian Patent No. 1,296,263
Approved by the City of New York Board of Standards

GENERAL SPECIFICATIONS

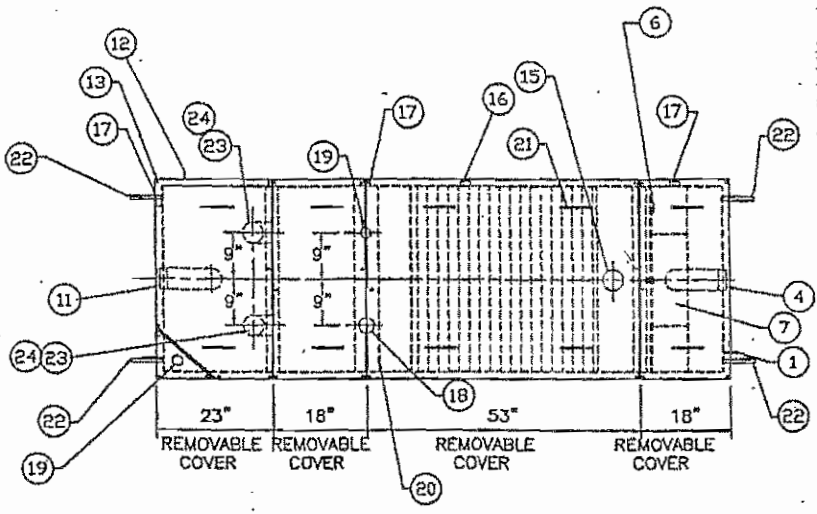
NO. REQ'D: (1)
CAPACITY: 600 GALLONS
SPILL CAPACITY: 200 GALLONS
TYPE: RECTANGULAR, HT, ABOVEGROUND, SINGLE WALL
MATERIAL: MILD CARBON STEEL
APPROX. WEIGHT: 2000 LBS.
FLOW RATE: 50 GPM
GAUGE:
7 GA THROUGHOUT

SURFACE PREP:
SSPC NO.10 BLAST ALL INTERIOR SURFACES
SSPC NO.6 BLAST ALL EXTERIOR SURFACES

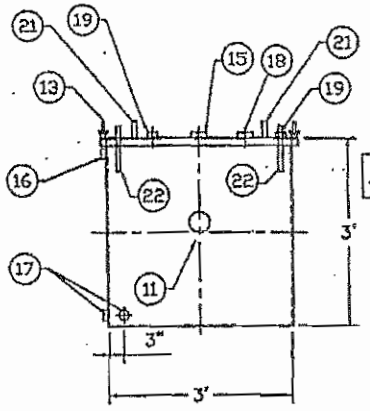
COATING:	MATERIAL	THICKNESS
EXTERIOR–	FINISH PAINT WHITE	(3 MILS)
INTERIOR–	CORROCOTE PW	(15 MILS)

CONSTRUCTION:
BUTT FIT AND WELD ALL CORNERS IN & OUT

NOTE:
1. ALL INTERNAL MATERIAL IS 10 GA.
2. ALL FITTINGS MUST SHIP W/ STEEL PLUGS INSTALLED
3. LIFTING LUGS DO NOT HAVE REINFORCING PLATES



PLAN VIEW



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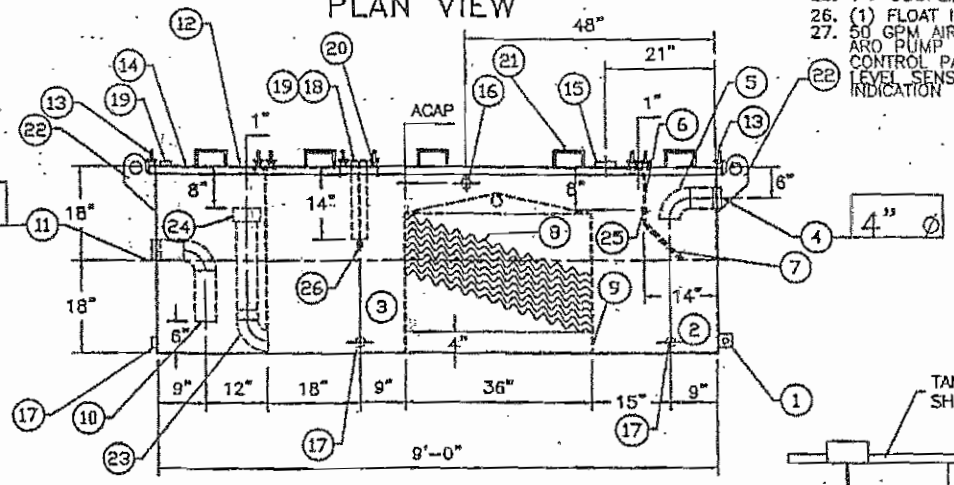
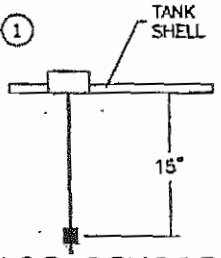


ELEVATION



INTERFACE SENSOR FLOAT POSITION
2A–15E

PROVIDED EQUIPMENT

1. 3"X3"X1/4" FLAT W/ 1/2"ø HOLE DRILLED IN CENTER (GROUNDING LUG)
2. SEDIMENT CHAMBER
3. OIL WATER SEPARATOR CHAMBER
4. THREADED INLET
5. PVC INLET ELBOW PIPING
6. VELOCITY HEAD DIFFUSION BAFFLE 10GA
7. WEAR PLATE (1/4" MATERIAL)
8. REMOVABLE PARALLEL CORRUGATED PLATE COALESCER (GALVANIZED) 1" PLATE SPACING
9. SLUDGE BAFFLE – 10GA
10. PVC OUTLET DOWNCOMER
11. THREADED OUTLET
12. REMOVABLE COVERS 4–REQUIRED (7 GA.)
13. NUTS & BOLTS W/ LARGE WING (CORROSION RESISTANT)
14. GASKET MATERIAL (FOR EACH REMOVABLE COVER)
15. 3"ø NPT (CLEAN–OUT)
16. 2"ø NPT (VENT)
17. 2"ø NPT (DRAIN)
18. 3"ø FULL COUPLING W/ 3" INTERNAL PVC PIPE
19. 2"ø NPT (FOR OIL LEVEL SENSOR)
20. 7GA. CROSSMEMBER 9" WIDE FOR OIL PUMP–OUT & LEVEL SENSOR FTG.
21. HANDLES PER H.T. STANDARD
22. LIFTING LUGS
23. 4"ø STEEL ELBOW W/ HALF COUPLING WELDED TO TOP FOR PVC RISER PIPES
24. 4"ø ADJUSTABLE FERNCO COUPLING
25. 1"ø COUPLING W/ PLUG
26. (1) FLOAT INTERFACE SENSOR
27. 50 GPM AIR OPERATED PUMP IN SYSTEM (NOT SHOWN), 50GPM ARO PUMP (666150–344–C), FILTER REGULATOR 66073–2), CONTROL PANEL NEMA 4 W/ SOLENOID VALVE, (2) A23M LIQUID LEVEL SENSORS, INT. SAFE ALARM SYSTEM W/ HI LEVEL INDICATION INCLUDED.

Fabrication Will Not Begin Until Approved Drawing is Received By Highland Tank

REVISIONS

Highland Tank

600 GALLON OIL WATER SEPARATOR
RECTANGULAR, HT, SINGLE WALL

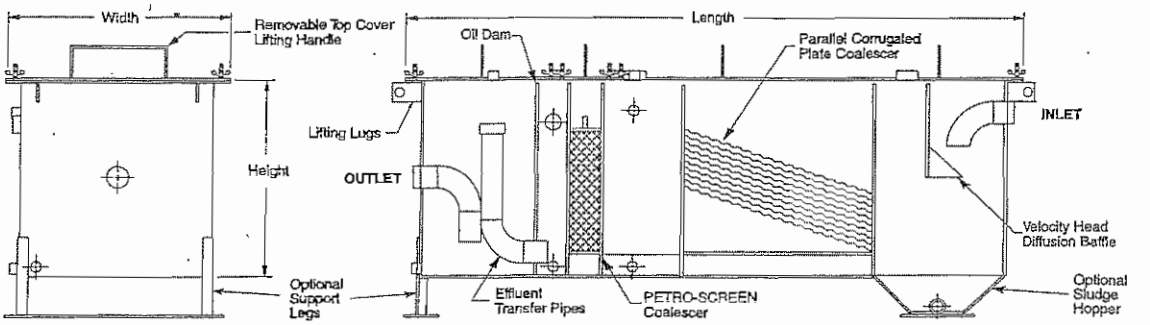
CUSTOMER: OCTAGON SERVICES INC.

PROJECT: IT CORP., ARMY NATIONAL GUARD PHOENIX , AZ.

QUOTE NO: 66063

SCALE:	DATE:	DWG. BY:	CHK'D BY	DWG. NO.:
1/2"=1'-0"	12-14-00	REM		001214 R-C

R-HTC General Arrangement



Model R-HTC with optional Sludge Hopper for 10 ppm oil/grease discharge (shown)
Model R-HT for 15 ppm oil/grease discharge
(Without PETRO-SCREEN Coalescer)

Recommended Guideline Specifications

Provide and install _____ Highland Tank _____ gallon capacity Model R-HTC Oil/Water Separator. Separator(s) shall be _____ (L) x _____ (W) x _____ (H).

Application

The separator shall be designed for gravity separation of free oils (hydrocarbons and other petroleum products) along with some settleable solids from waste water. Separator shall be installed above-ground, at grade level or below ground in a vault. The source of the influent to the separator shall be gravity flow from surface runoff and spills.

Performance

Influent Characteristics

Provide Separator designed for intermittent and variable flows of water, oil or any combination of non-emulsified oil-water mixtures ranging from zero to _____ GPM. Operating temperatures of the influent oil in water mixture shall range from 40° to 180° F. The specific gravities of the oils at operating temperatures shall range from 0.68 to 0.95 and the petroleum hydrocarbon concentration less than or equal to 200,000 mg/l (20%). The specific gravity of the fresh water at operating temperatures shall range from 1.00 to 1.03.

Effluent Characteristics

The oil and grease concentration in the effluent from the Separator shall not exceed 10 mg/l (10 ppm). To achieve his goal, it will be necessary to remove all free oil droplets equal to and greater than 20 microns.

Design Criteria

Separator shall be designed in accordance with Stokes Law nd the American Petroleum Institute Publication 421, Monographs on Refinery Environmental Control – Management of Water Discharges, Design and Operation f Oil-Water Separators."

eparator shall be the standard product of a steel tank anufacturer regularly engaged in the production of such quipment. No subcontracting of tank fabrication shall be ermitted.

eparator shall be fabricated, inspected and tested for akage before shipment from the factory as a completely sembled vessel ready for installation.

eparator shall be rectangular, horizontal, atmospheric- e steel vessel intended for the separation and storage of mmable and combustible liquids. The separator shall ve the structural strength to withstand static and

The Oil/Water Separator shall have an oil storage capacity equal to 30% of the total vessel volume and an emergency oil spill capacity equal to 60% of the total vessel volume.

Separator shall consist of inlet and outlet connections, non-clogging flow distributor and energy dissipator device, stationary under flow baffle, presettling chamber for solids, sludge baffle, oil coalescing chamber with removable inclined parallel corrugated plate and polypropylene impingement coalescers to optimize separation of free oil from liquid carrier, oil dam, effluent transfer pipes, effluent downcomer at the outlet end of the separator to allow for discharge from the bottom of the effluent clearwell only, access cover(s) for each chamber, fittings for vent, oil and sludge pump-out, sampling, gauging, drain, and lifting lugs.

General Description

Separator shall be a rectangular inclined parallel corrugated plate oil water separator with removable top cover(s). The separator shall be a pre-packaged, pre-engineered, ready to install unit consisting of:

An influent connection _____ inch. An internal influent nozzle at the inlet end of the separator, located at the furthest diagonal point from the effluent discharge opening.

A velocity head diffusion baffle at the inlet end to:

- reduce horizontal velocity and flow turbulence
- distribute the flow equally over the separator's cross sectional area
- direct the flow in a serpentine path in order to enhance hydraulic characteristics and fully utilize all separator volume
- completely isolate all inlet turbulence from the separation chamber

A sediment chamber to disperse flow and collect oily solids and sediments.

A sludge baffle to retain settleable solids and sediment preventing them from entering the separation chamber.

An Oil/Water Separation Chamber containing a removable inclined parallel corrugated plate coalescer to:

- shorten the vertical distance than an oil globule has to rise for effective removal.
- enhance coalescence by generating a slight sinusoidal (wave like) flow pattern thereby causing smaller, slow rising oil globules to coalesce together on the undersides of the plates forming larger, rapidly rising sheets of oil.

and a removable "PETRO-SCREEN™" polypropylene impingement coalescer designed to intercept oil globules ≥ 20 microns in diameter.

An oil dam with two (2) effluent transfer pipes.

An effluent downcomer at the outlet end of the separator, to allow for discharge from the bottom of the clearwell only.

An effluent connection _____ inch.

Fittings for vent, interface/level sensor, and waste oil and sludge pump-out, sampling, drain, and gauge.

Removable top cover(s) with gaskets and bolts.

Lifting lugs at balancing points for handling and installation.

Identification plates: Plates to be affixed in prominent location and be durable and legible throughout equipment life.

Internal surfaces commercial sand-blast, coated with 10 mils DFT Polyurethane or as specified.

External surfaces commercial sand-blast, coated with Polyurethane or as specified.

For information and specifications on models other than the R-HTC, contact Highland Tank or an authorized factory representative.

Accessories and Options

Oil level controls to activate audible and visual alarms at predetermined oil levels. All components are intrinsically safe and enclosed in NEMA IV enclosures.

Oil level/liquid level controls to start and stop an explosion proof oil pump and to activate audible and visual alarms at predetermined oil levels. All components are intrinsically safe and enclosed in NEMA IV enclosures.

Slotted pipe oil skimmer which can be manually adjusted to drain off precisely the amount of oil desired.

Effluent level controls to start and stop an explosion proof effluent pump and to activate audible and visual alarms at predetermined levels in the effluent clearwell. All components are intrinsically safe and enclosed in NEMA IV enclosures.

Consult Highland Tank for:

- Special coatings (interior or exterior)
- I-Beam Saddles or Skids
- Integral Oil Compartment
- Sludge Hopper
- Level Controls

APPENDIX G
HIGHLAND TANK USER'S MANUAL

Maintenance

CAUTION: Separated liquid oil and vapors are flammable and/or combustible.

WARNING: Never enter an OWS or enclosed space, under any condition, without proper training and OSHA approved equipment. (Consult OSHA guidelines 29 CPR, Part 1910 "Permit Required Confined Spaces.")

All enclosed spaces must be properly vented prior to entry to avoid ignition of flammable materials or vapors.

Atmosphere must be properly tested for combustible vapors and oxygen prior to entry.

Entering the OWS without using a self-contained breathing apparatus may result in inhalation of hazardous fumes, causing headache, dizziness, nausea, loss of consciousness, and death. Required entry equipment includes, but is not limited to;

- Lifelines
- Safety harnesses (safety belts are unacceptable)
- Self-contained breathing apparatus
- Respirators (canister type)
- Rescue harness and ropes
- Horns, whistles, radios, etc. (for communication purposes)
- Explosion-proof lighting

Important: Be sure to inspect and replace manway gaskets as necessary when the OWS is shut-down for maintenance.

The coalescer plates and packs can be removed for cleaning or can be cleaned from above using a hot-water pressure wash with extension wand.

Mechanical lifting is required to remove the coalescer packs in large diameter OWS.

Inlet and effluent pipe valves should be closed prior to OWS entry.

All liquid must be removed from the OWS prior to entry.

Any and all oil recovered and removed from the OWS should be recycled or disposed of in accordance with federal, state, and local codes and regulations.

CAUTION: Interior surfaces of the OWS will be slippery.

OWS are designed for long-term, trouble-free operation. The following maintenance should be performed as needed or in accordance with a facility maintenance schedule.

Periodic inspection of:

- Upstream trench drains, sand interceptors, and traps
- Inside of the OWS for sand, trash, sludge and oil build-up
- Effluent for oils and other contaminants in accordance with local codes and permits
- Oil level in accordance with local codes and permits

OWS's with oil level sensors require oil removal when the alarm is activated. Simply remove the oil, then refill OWS with clean water (see Start-Up Instructions).

OWS's without oil level sensors require level checking by use of a gauge stick with oil/water sensing paste. If oil/water interface level is below that shown on the Oil Level Chart, oil needs to be removed and the OWS refilled with clean water.

WARNING: If the oil is not pumped out, the oil concentration in effluent may exceed the desired levels. Oil should only be removed during non-flow conditions to ensure pure oil draw-off.

Maintenance (cont'd.)

If contaminants are found, close the valve on the inlet line, determine what the requirements are for restoring working order and take appropriate action.

For optimum performance, maintenance is required as needed or at least:

Once per year or when:

Bottom sludge in tank is 12" deep;

The effluent exhibits an oil sheen or contains high contaminant levels.

Inspect OWS after a heavy rainfall to check for signs of malfunction due to an excessive flow rate.

If the OWS has been cleaned within the year and only bottom sludge has built up while the effluent water is contaminant free, it may be sufficient to vacuum the sludge from the sediment chamber and refill OWS with clean water. (See Start-Up Instructions.)

Oil Removal Procedures

Important: Oil should only be removed during non-flow conditions to ensure pure oil draw-off.

Oil Removal Procedures (with optional oil level controls)

Be sure the High Oil Level Warning Alarm is activated because of an actual high oil level, otherwise a mixture of oil and water will be removed.

To minimize water contamination of the oil, connect the oil suction hose to the 4" diameter Oil Pump-out Pipe fitting/coupling.

Suction out the oil.

Refill OWS with clean water to deactivate the High Oil Level Warning Alarm. (See Start-Up Instructions.)

Oil Removal Procedures (without optional oil level controls)

Determine where the oil/water interface by using a gauge stick and oil/water sensing paste.

If the oil/water interface is less than the level found on the Oil Level Chart for your model, suction out the surface oil from the 4" diameter Gauge Port or the manway, otherwise a mixture of oil and water will be removed.

If the oil/water interface is equal to or greater than the level found on the Oil Level Chart, connect the oil suction hose to the 4" diameter Oil Pump-out Pipe fitting/coupling and suction out the oil.

Refill with clean water. (See Start-Up Instructions.)

Mixed Oil and Water Removal Procedures

Place a 3" or smaller suction hose inside the OWS through either the 4" diameter Gauge Port or through the Sediment Chamber Manway.

The suction hose nozzle should be 12" or higher above the OWS bottom. If nozzle extends closer to the bottom, sludge may be inadvertently removed.

Suction out OWS contents.

Refill with clean water. (See Start-up Instructions.)

Major Oil Spill Response Procedures

Important: A major oil spill is a spill which exceeds the normal oil storage capacity of the OWS. In the event of a major spill, notify proper authorities as required by federal, state, and local laws.

After a major oil spill, the OWS should always be emptied, cleaned, and refilled with clean water.

Oil Spill Removal Procedures (with or without optional oil level controls)

If OWS has optional oil level controls, be sure the High and High-High Oil Level Warning Alarms are activated because of an actual High-High oil condition.

Determine exactly where the oil/water interface is located using a gauge stick and oil/water sensing paste.

Open the 4" diameter Gauge Port or Sediment Chamber Manway.

Apply oil/water sensing paste to a gauge stick.

Place gauge stick into the OWS through the 4" diameter Gauge Port or Manway to determine the oil/water interface location.

Place a 3" diameter or smaller suction hose inside the OWS through either the 4" diameter Gauge Port or through the Manway.

Lower hose to exact oil/water interface location. If the suction hose nozzle extends lower than the oil/water interface, water may be inadvertently removed with the oil.

Suction out the oil.

Refill with clean water. (See Start-Up instructions.)

If oil is still visible on the surface of the OWS or the alarms remain on, suction out the oil and refill with clean water.

Continue this sequence until only a sheen of oil is visible on the surface of the OWS or the alarms deactivate.

Sludge Removal Procedures

Determine exactly where the sludge/water interface is located using a wooden gauge stick.

Open the 4" diameter Gauge Port or Sediment Chamber Manway.

Place gauge stick into the OWS through the 4" diameter Gauge Port or Manway.

Slowly lower the gauge stick until it comes into contact with the sludge blanket. Mark the stick.

Push the stick downward until it comes into contact with the Striker Plate on the OWS bottom. Mark the stick.

The sludge depth is the difference between the two measurements.

Sludge Removal Procedures (for full OWS)

Place a 3" diameter or smaller suction hose inside the OWS through either the 4" diameter Gauge Port or through the Manway.

Lower hose to exact sludge/water interface location.

Suction out the sludge while slowly lowering the suction hose nozzle until it comes into contact with the Striker Plate on the OWS bottom.

Refill with clean water. (See Start-Up Instructions.)

Sludge Removal Procedures (cont'd.)

Sludge Removal Procedures (for completely empty OWS)

Warning: Never enter an OWS or enclosed space, under any condition without proper training and OSHA approved equipment (Consult OSHA guidelines 29 CPR, Part 1910 "Permit Required Confined Spaces").

Suction out sludge and debris. Use caution to avoid internal coating damage.

Using a standard garden hose at normal pressure (40-70 PSIG), with or without a spray nozzle, loosen any caked oily solids. Use of hot water can be helpful.

Direct the water stream to the OWS wall side and bottom.

Suction out the resultant slurry.

General OWS Cleaning Procedures

If not properly maintained, the OWS may malfunction.

NOTE: Over a period of time sediment, oil, and grease will build up on the walls and floors of the OWS. Dirt and heavy oil may also build up on the Parallel Corrugated Plate Coalescer reducing the unit's efficiency. Also, the PETRO-SCREEN™ removes some suspended solids along with the small oil droplets in the wastewater. Periodic cleaning of the PETRO-SCREEN™ is also required.

Important: It is recommended that the OWS be cleaned as needed or at least once a year. Keep inspection and maintenance logs and have them available for ready reference.

Sediment Chamber

Remove manway cover to expose the Sediment Chamber being careful not to damage the gasket.

Pump-out contents of OWS (see Mixed Oil and Water Removal Procedures).

Gauge the level of sand, dirt, or debris with wooden gauge stick.

Important: The level of sand, dirt, or debris should not be allowed to accumulate higher than 12" from the bottom of the OWS.

Remove the accumulated waste with a suction hose (See Sludge Removal procedures).

Direct a high pressure hose downward to loosen any caked oily solids on OWS sides and bottom.

NOTE: Use of high-temperature, high-pressure washing equipment along with Highland Cleaner can be helpful in OWS cleaning. Highland Cleaner is very effective and is 100% Biodegradable, non-emulsifying, and contains no Linear Activated Solvents (LAS), Phosphates, Ammonia, or Acids.

Attach spray nozzle wand extension to the high pressure hose.

Direct spray downward and toward the velocity head diffusion baffle to loosen up any caked oily solids that may have accumulated on inlet head.

Direct the spray to the OWS wall sides, top and bottom.

Remove the slurry with the suction hose.

Oil Water Separator Chamber

Disconnect all non-voltage carrying sensor lines to the Oil Level Sensor.

Carefully remove the Oil Level Sensor.

Carefully check the Oil Level Sensor floats. If the floats do not slide easily on the stem or have sludge on them, clean the Oil Level Sensor. Use a parts washer and mineral spirits to remove accumulated oil, grease, or sludge.

Check the Oil Level Sensor with an OHM meter to assure proper operation.

Place the Oil Level Sensor in a safe area to prevent damage.

Remove manway cover over the 24" diameter manway to expose the Oil Water Separation Chamber.

Be careful not to damage the gasket.

Gauge the level of sand, dirt, or debris with wooden gauge stick.

Remove the accumulated waste with a suction hose (see Sludge Removal Procedures).

Direct a high pressure hose downward and around to loosen caked oily solids on OWS sides, top and bottom.

Attach spray nozzle wand extension to the high pressure hose.

Direct spray downward and toward the Parallel Corrugated Plate Coalescer to loosen up caked oily solids that may have accumulated on top of plates.

Flush the Parallel Corrugated Plate Coalescer from the outlet side to direct debris to Sediment Chamber.

NOTE: The coalescer packs must be cleaned of all sludge to operate properly.

Direct the spray to the OWS wall sides, top and bottom. Rotate the nozzle sufficiently and often so that all areas are reached with the spray.

Remove the slurry with a suction hose.

PETRO-SCREEN™ Coalescer

Important: Coalescer packs CAN BE cleaned in place or removed for cleaning. Mechanical lifting equipment is required to remove the coalescer packs in larger units.

Hook the Lifting Rod to the Lifting Lug on the coalescer pack and remove the coalescer pack directly below the manway.

Using the Lifting Rod, slide the next coalescer pack over and remove.

Continue until all coalescer packs have been removed and are above grade.

Place coalescer packs on oil absorbent blanket or sheet plastic.

NOTE: The coalescer packs should be moved to a convenient location upstream of the separator and washed to remove any gummy deposits.

Using a standard garden hose at normal pressure (40–70 PSIG) — with or without a spray nozzle — loosen any caked solids.

Flush the coalescer packs from both sides.

Let coalescer packs stand and dry.

PETRO-SCREEN™ Coalescer (cont'd.)

Visually inspect the OWS interior and components for any damage.

NOTE: If any visual damage exists, contact Highland Tank for further instructions.

Reinstall the coalescer packs.

The coalescer packs *must be* installed sitting on top of the bottom steel channel supports.

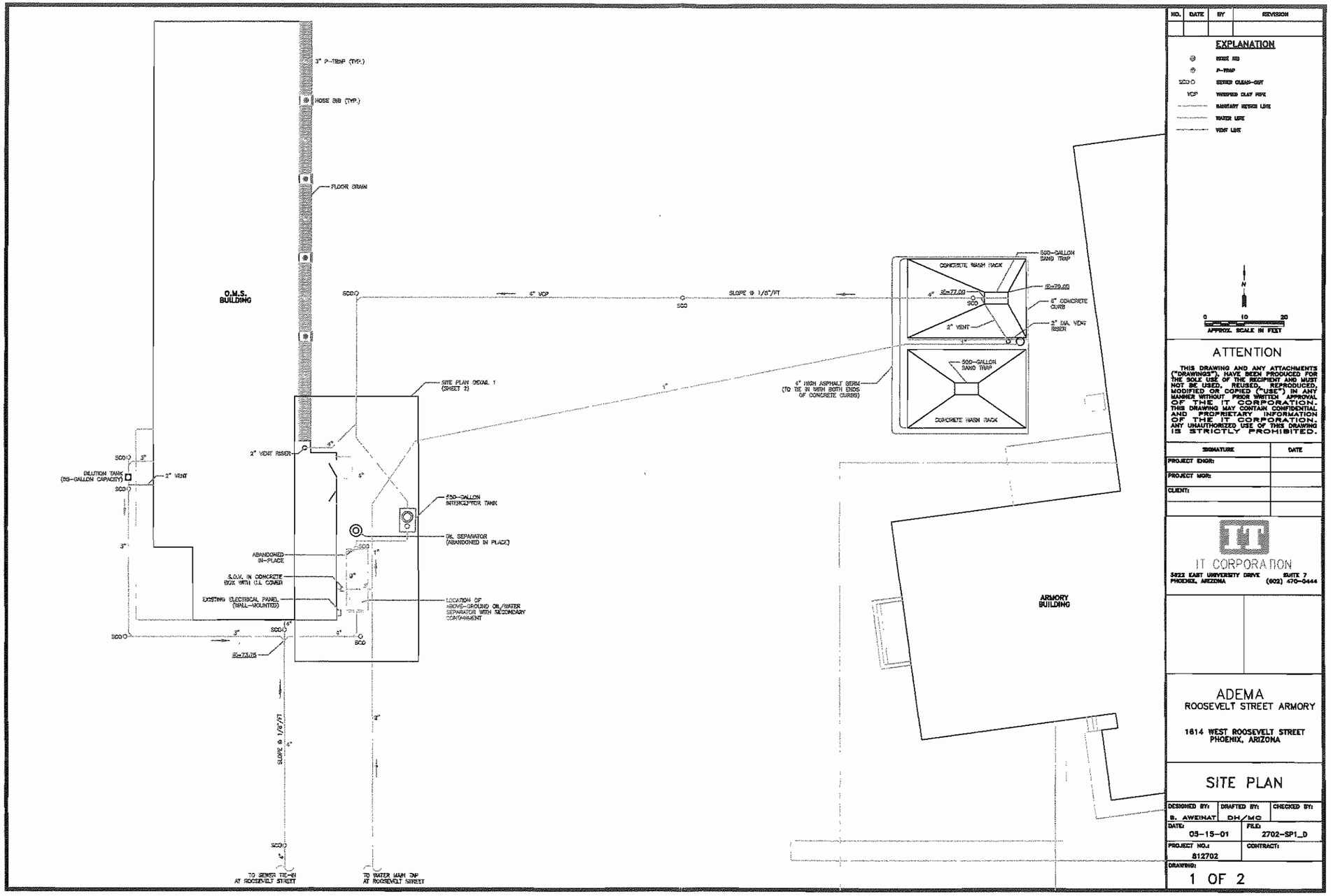
NOTE: Improper installation will result in separator malfunction.

Reattach the manway cover. Ensure the gasket is damege free.

Install the Oil Level Sensor in the 2" diameter Interface and Level Sensor Pipe.

Reconnect all non-voltage carrying sensor lines to the Oil Level Sensor.

Refer to OWS Start-Up Instructions for proper refilling and restarting procedures.



NO.	DATE	BY	REVISION

EXPLANATION

- HOSE BIB
- P-TRAP
- SCO — SEWER CLEAN-OUT
- VCP — VITRIFIED CLAY PIPE
- SANITARY SEWER LINE
- WATER LINE
- VENT LINE

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APPROX. SCALE IN FEET

ATTENTION

SIGNATURE	DATE
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

IT CORPORATION
3522 EAST UNIVERSITY DRIVE SUITE 7
PHOENIX, ARIZONA (602) 470-0444

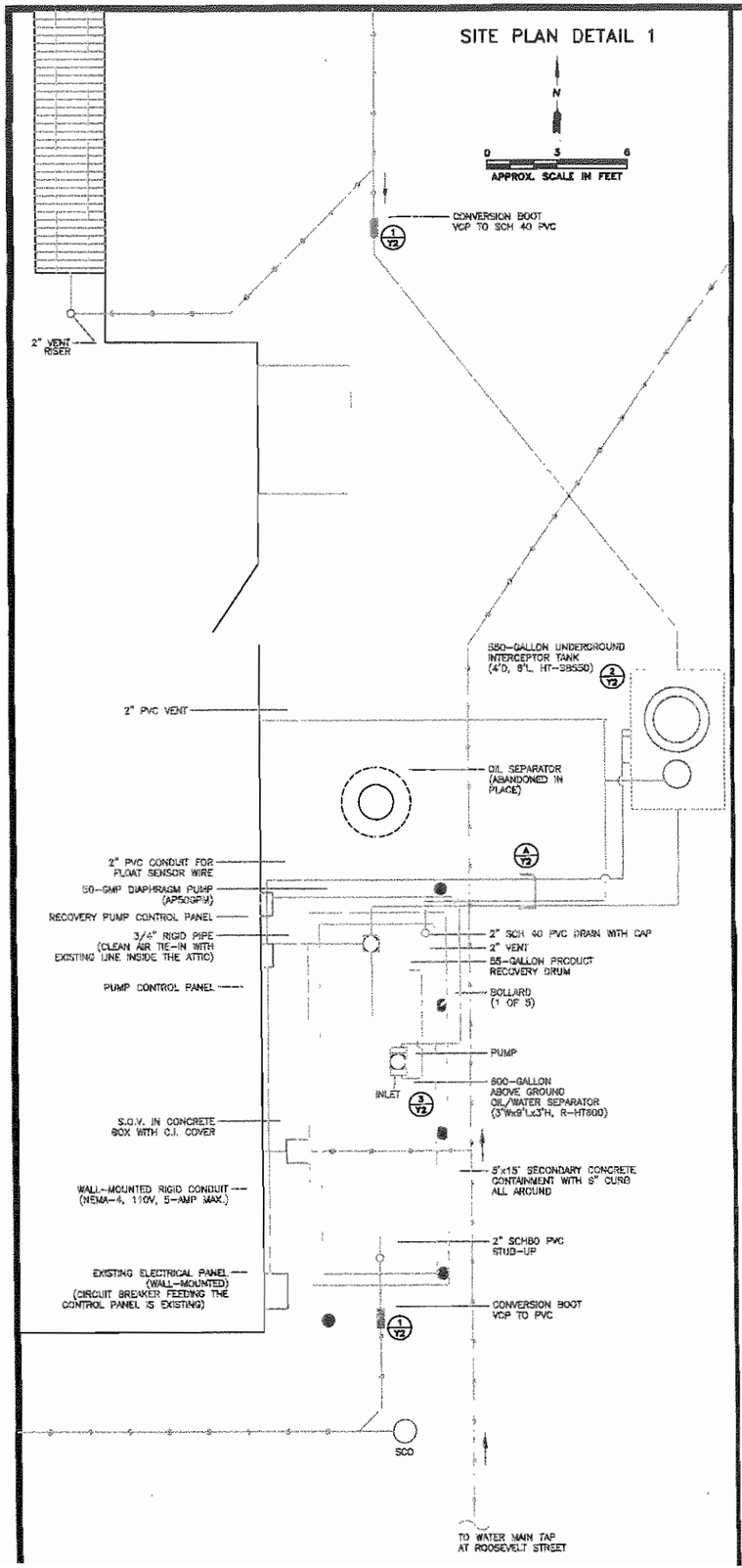
ADEMA
ROOSEVELT STREET ARMORY

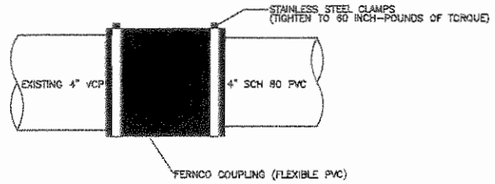
1814 WEST ROOSEVELT STREET
PHOENIX, ARIZONA

SITE PLAN

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
S. AWEINAT	DH/MC	
DATE: 03-15-01	FILE: 2702-SP1_D	
PROJECT NO.: 812702	CONTRACT:	
DRAWING: 1 OF 2		

SITE PLAN DETAIL 1





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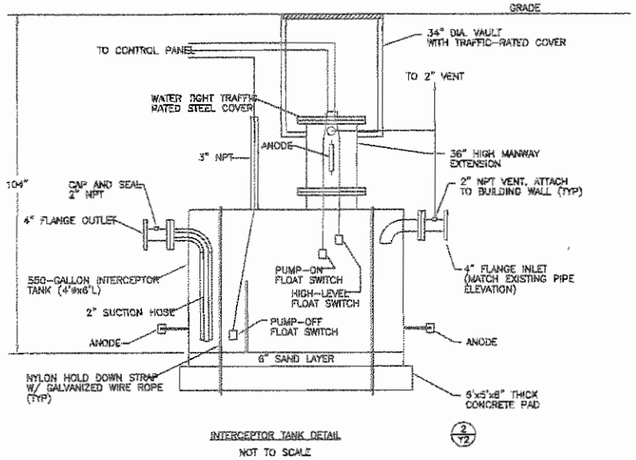

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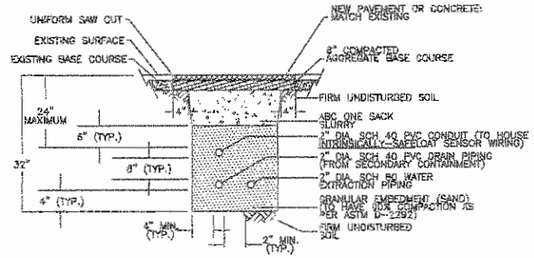

TRENCH SECTION A/Y2
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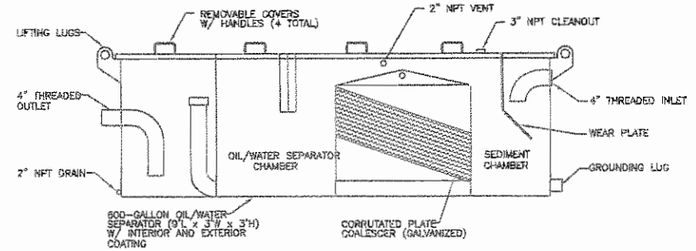


OIL/WATER SEPARATOR DETAIL 3/Y2
NOT TO SCALE

NO.	DATE	BY	REVISION

EXPLANATION

HB	HOSE BIB
PT	P-TRAP
SCO	SEWER CLEAN-OUT
VCP	VITRIFIED CLAY PIPE
	SANITARY SEWER LINE
	WATER LINE
	PVC PIPING

SIGNATURE	DATE
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

IT CORPORATION
4114 WOOD STREET
PHOENIX, ARIZONA (602) 470-0444

ADEMA
ROOSEVELT STREET ARMORY

1614 WEST ROOSEVELT STREET
PHOENIX, ARIZONA

SITE PLAN AND DETAILS

DESIGNED BY:	DRAFTED BY:	CHECKED BY:
B. AWEINAT	DH/MC	

DATE:	FILE:
05-15-01	2702-DET_0
PROJECT NO.: 812702	CONTRACT:

DRAWING:

ATTACHMENT 2.

OPERATIONS AND MAINTENANCE MANUAL INDUSTRIAL WASTEWATER PRETREATMENT SYSTEM UTES FACILITY FLORENCE, ARIZONA

Prepared for
ARIZONA ARMY NATIONAL GUARD (AZARNG)

URS Project No. 23441916
October 24, 2002

LIST OF TABLES

LIST OF PHOTOGRAPHS

LIST OF AS-BUILT CONSTRUCTION DRAWINGS

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

URS Corporation (URS) has prepared this Operations and Maintenance (O&M) manual on behalf of the Arizona Army National Guard (AZARNG) to provide procedures and/or practices for operating and maintaining the Industrial Wastewater Pretreatment System (IWPS) located at the Unit Training Equipment Site (UTES) Facility in Florence, Arizona.

The IWPS was designed and installed by URS to replace a previously existing Oil-Water Separator (OWS) system that was used at the UTES by AZARNG personnel. The new IWPS incorporates the existing wash rack pad located at the southeast section of the facility. With the exception of conveyance piping runs originating from the UTES maintenance bay drains, all other components and devices associated with the IWPS are new installations.

The facility's IWPS has several components that include the pre-existing wash rack, sediment settling devices, trench drains, conveyance piping, submersible pumps, and an aboveground OWS unit.

1.1 SECTION REFERENCE ATTACHMENTS

- Drawing No. 1 - Cover and Index Sheet
- Drawing No. 2 - Site Plan

2.0 SYSTEM INFLOWS

The IWPS receives inflows that include storm water runoff, sediment, and industrial wastewater. Inflows are received by the system through the wash rack trench drains, sediment basin maintenance bay drains, and maintenance bay wash sink.

2.1 STORM WATER RUNOFF

Storm water runoff enters the system when rainfall is captured on the surface pavement of the vehicle wash rack area, including the south wash rack's sediment basin. Runoff may contain sediment carryover from the site's unpaved surface grades that can drain to one of two lateral trench drains located in each of two sections of the wash rack pad. The north section is used for vehicle undercarriage/engine cleaning and the south section is used for exterior vehicle cleaning only.

2.2 SEDIMENT

Sediment can enter the system through drainage devices located at the wash rack station. The site is unpaved and the presence of wind, rainfall, or adverse weather conditions can facilitate and/or accelerate the transportation of sediment deposits onto the wash rack area and the south wash rack's sediment basin. Storm water runoff is capable of transporting sediment across the site as influenced by the site's sheet flow that appears to drain west to east over the unpaved surface grade toward the vicinity of the wash rack and sediment basin.

2.3 INDUSTRIAL WASTEWATER

Industrial wastewater is generated from maintenance activities conducted in each of the facility maintenance building mechanic bays (Typical of 4), as well as vehicle-related cleaning activities occurring at the wash rack.

2.3.1 Mechanic Bay Area

Fluids resulting from vehicle maintenance and floor cleaning conducted in the mechanic bays drain to trench drains located on the south end of each bay. Each trench drain includes one screened 4-inch-diameter drain. Fluids drain by gravity through subgrade conveyance piping into the newly installed sediment trap located within the IWPS pump sump. The maintenance building wash sink located in the mechanic bay area also drains to the floor drain conveyance piping system. The sink is used for employee hand washing only. Fluids draining to the IWPS

from the maintenance building can be impacted with petroleum constituents, solvents, degreasing agents, and/or surfactant residuals used in performing maintenance/cleaning activities.

2.3.2 Wash Rack Area

Vehicle washing is performed at the wash rack by using potable water with non-toxic biodegradable degreasers. Wash water from these activities may become impacted with petroleum constituents and/or sediment associated with facility vehicle cleaning. To minimize sediment carryover into the system, the exteriors of all vehicles are washed on the southern section of the rack while heavy use, engine, and undercarriage cleaning is conducted on the northern section.

2.4 SECTION REFERENCE ATTACHMENTS

- Drawing No. 2 - Site Plan
- Drawing No. 6 - Sediment Trap/Sump Plan
- Drawing No. 8 - Wash Rack Plan
- Drawing No. 9 - Wash Rack Sections and Details
- Drawing No. 10 - Sediment Basin Plan
- Drawing No. 11 - Sediment Basin Sections and Details

3.0 SYSTEM PROCESS FLOW DESCRIPTION

The IWPS is designed to receive, distribute, and provide pretreatment for inflows received from storm water runoff, sediment, and industrial wastewater from vehicle washing and maintenance activities.

Inflows are received by the system as described in Section 2.0 of this manual. Inflows received at the north wash rack drain to a lateral trench drain located at the south end of that section. This drain extends to subgrade piping that drains by gravity directly to the IWPS sediment trap located inside the system's pump sump. Inflows received at the south section of the wash rack drain to a lateral trench drain located at the south end of that section as well. Wash water and sediment received by this trench drain to a concrete sediment basin before draining to subgrade conveyance piping leading to the IWPS sediment trap located within the pump sump. Inflows from the maintenance building mechanic bays also drain by gravity to the sediment trap within the pump sump.

In the sediment trap, sediment and/or grit particles are removed from wastewater through control of velocity and discrete settling, in which sediment and grit particles settle to the bottom of the trap while putrescible matter remains suspended. Wastewater overflows the top of the trap into the pump chamber of the sump in which one low-flow and high-flow pump assembly are located, respectively.

Pump operation is automated, and controlled by level controls that actuate a lead-lag configuration. The lead pump operation is accomplished with actuation of the low-flow pump, which conveys industrial wastewater to the OWS system at a design flow of 40 gallons per minute (gpm). The high-flow pump (lag pump) will begin operation only if inflows exceed the low flow pump capacity, removing wastewater at a design flow of 125 gpm. When the lead-lag level control system actuates, both pumps will operate concurrently until the sump liquid level descends and the pumps reach their respective low-level control set points.

Industrial wastewater is pumped to the OWS, where remaining solids and oil, or oily substances are removed from the wastewater by gravity flow. Product is recovered in the OWS and discharges by gravity to a 55-gallon reclaimed oil drum located on a secondary spill containment pallet at the west side of the separator. Once separation is complete the effluent water from the OWS discharges by gravity into the Town of Florence sanitary sewer system.

3.1 SECTION REFERENCE ATTACHMENTS

- Figure 1 - General Process Flow Diagram

8.0 SEDIMENT TRAP/SUMP

8.1 DESCRIPTION

The sediment trap/sump receives wastewater inflows by gravity from the UTES mechanics bays, north wash rack, and sediment basin. The purpose of the sediment trap is to prevent sediment contained in on-site inflows from being carried over into the pump chamber of the sump. There are two submersible pumps in the pump chamber that facilitate the distribution of industrial wastewater to the OWS for pretreatment.

The sediment trap/sump vault is a permit required confined space and work occurring inside the vault must be conducted in accordance with Occupational Safety and Health Administration guidelines (OSHA), Title 29 Code of Federal Regulations (CFR) 1910.146.

8.2 OPERATION

The inflow from the north wash rack and sediment basin are conveyed in two separate 4-inch-diameter Schedule 40 PVC subgrade pipes. The pipes are oriented parallel to one another and drain into and above the east side of the sediment trap. The sediment trap/sump consists of a pre-cast concrete utility vault with a single baffle wall where sediment is captured on the inlet side in a removable stainless steel bin (maximum capacity of approximately 17.5 ft^3). Wastewater overflows the baffle wall into a pump chamber, where it is pumped to the OWS. The stainless steel bin can be removed using on-site equipment (forklift) to dispose of accumulated sediments. The approximate estimated weight of the trap full is 1.6 tons.

8.3 MAINTENANCE

The depth of sediment in the sediment trap should be measured weekly with a clean measuring rod or tank stick. Accumulated sediment should be emptied when the level reaches an approximate thickness of 18 inches.

GENERAL NOTE

Activities that generate system inflows should be prohibited during sediment trap removal and cleaning. Surface water on top of the accumulated sediment in the trap should be removed prior to trap removal. The on-site portable Teel® pump can be used for pumping surface water to the pump chamber of the sediment trap/sump.

Removal of the bin can be accomplished by using the following procedures that include a forklift and spreader bar incorporating a four-leg chain bridle outfitted with lifting hooks that has a capacity to lift 3.2 tons:

- Attach the bridle lifting hooks to fabricated lifting hooks located on the bin.
- Remove and transport the bin to the north wash rack for staging.
- Turn the bin on its side on the north wash rack to empty the contents by unhooking a common side containing two of the four lifting hooks while the bin is staged.
- Mechanically fit the bin from one side, allowing the bin to tip until it rests on its side to allow sediment to fall and/or disperse onto the wash rack slab. Caution should be exercised to ensure that sediment does not drain to the trench drain.
- Employ hand shoveling to remove sediment remaining in the bin. Recovered sediment should be placed in 55-gallon drums or other approved containers. The bin should be wiped clean and temporarily staged on the rack to allow for inspection of the sediment trap vault chamber.
- The trap vault chamber may require cleaning prior to re-installing the bin. The chamber should be checked for sludge and/or accumulated sediment with a rigid tank stick or other alternate, but equal measuring device. Accumulated sludge or sediment present must be removed prior to re-installing the bin. Removal can be accomplished from grade surface with the use of a vacuum truck. If removal activities are completed inside the vault chamber, they must be performed in accordance with confined space entry regulations as per OSHA 29 CFR 1910.146. The removal of sediment and sludge from the chamber will ensure that the angle iron lip of the bin rests flush with the wall sections of the sump; preventing sediment intrusion along the sidewalls and bottom of the bin when the system is operating.
- Once the trap vault chamber has been cleared of accumulated sludge or sediment, the trap bin can be re-installed with the use of an equipment forklift and bridle assembly. It is important to observe that the angle iron lip of the bin is resting flush mounted on the wall sections of the sump.

8.4 SECTION REFERENCE ATTACHMENTS

- Drawing No. 6 - Sediment Trap/Sump Plan
- Drawing No. 7 - Sediment Trap/Sump Sections and Details
- Drawing No. 12 – General Sections and Details
- Appendix B - Sediment Trap/Sump Vault Shop Drawing
- Appendix K - Teel® Submersible Pump – Manufacturer's Literature
- Table 5 - Checklist for Sediment Trap / Sump

9.0 DUPLEX PUMP OPERATION

9.1 DESCRIPTION

Two electric operated submersible pumps (low-flow and high-flow) are located within the pump chamber section of the sediment trap/pump sump. Each pump transfers wastewater from the pump chamber to the aboveground OWS. The pump pipe layout, typical of two assemblies, includes 2-inch Schedule 40 galvanized steel (riser) and Schedule 40 PVC piping with inline true-union connections, ball valves, and check valves. Each pump casing is attached to a 3/16-inch lift chain to support removal for maintenance. A general summary of pump specifications is presented below.

GENERAL PUMP SPECIFICATIONS TABLE

ITEM	LOW FLOW PUMP (Lead Pump)	HIGH FLOW PUMP (Lag Pump)
Manufacturer	GOULDS	GOULDS
Pump Type	Submersible Model 3886	Submersible Model 3887 BHF
Manufacturer Order No.	WS0512B	WS1012BHF
Horse Power	0.5 HP	1.0 HP
Operating Power Supply	230 Volts/Single Phase/60 HZ	230 Volts/Single Phase/60 HZ
Maximum Amperage	7.3 Amps	13.0 Amps
Weight	65 pounds	85 pounds

9.2 OPERATION

Inflow received in the pump chamber is pumped to the OWS through a 4-inch-diameter Schedule 40 PVC conveyance pipe run. Preceding the pipe run, wastewater inflows are pumped at low- or high-flow conditions through 2-inch-diameter galvanized risers followed by 4-inch diameter brass check valves and 4-inch-diameter Schedule 80 PVC ball valves.

The low-flow pump is used for normal facility operations and storm water conditions. Design flow under this pumping condition was estimated at approximately 40 gpm at 20 feet Total Dynamic Head (TDH). The high-flow pump operates during increased inflow conditions resulting from elevated precipitation or high-volume facility washing activities. Design flow for high pump operation is approximately 125 gpm at 25 feet TDH.

Pump operation is accomplished with hand-off-auto toggle switches located inside the pump control panels. The electric circuit breaker panel (LD) located inside the mechanic bay area provides the sub-feed power at 208 volts, single phase, 60 hertz to the pump control panels. Photograph 9 of this manual shows the electric circuit breaker panel. Preceding the control

panels are two vertically mounted transformers that step-up the inline supply voltage from 208 volts to 230 volts. Photograph 6 shows each transformer mounted beneath their respective pump control panel. From the transformers each pump control panel is supplied with 230 volts. The high flow control panel includes a toggle switch for control power as shown in photograph 7. The control power toggle when on provides control voltage at 120 volts to the motor contactors, relays and all associated level sensors and alarms to accomplish automated system operation. An electric circuit breaker summary table presented below provides a general listing of the equipment service panel "LD" previously discussed in this section.

ELECTRIC CIRCUIT BREAKER PANEL SUMMARY

PANEL LD LEGEND

PANEL NO.	CIRCUIT BREAKER ID	NO. POLES	AMP RATING (PER POLE)	EQUIPMENT
2,4	Lead Low Flow Pump	2	15	LF Control Panel
3	PC OWS	1	20	-OWS Panel - Remote Off-site Monitoring Panel
6,8	Lag High Flow Pump	2	30	HF Control Panel
10	Receptacle - Sediment Trap	1	20	Sediment Trap GFCI
12	Receptacle - OWS	1	20	OWS GFCI

OWS: Oil-Water Separator
LF: Low Flow
HF: High Flow
GFCI: Ground Fault Circuit Interrupter Receptacle

A series of five level control sensors dictate operation of the duplex pump arrangement. The level controls are adjustable and are positioned to actuate pumping operation at various levels in the pump chamber. The level controls operate at a control voltage of 120 volts. The actuation sequences allow the pumps to operate in a lead-lag mode that accommodates low- or high-volume inflows occurring at the facility.

The level control sensors are set to actuate in the following positions.

- Two level sensors are positioned approximately 1 foot above the bottom of the pump chamber (position number 1). One control deactivates the low-flow pump and the second deactivates the high-flow pump.

- The level sensor in position number 2 is positioned 2 feet above the bottom of the pump chamber and initiates low-flow pump operation.

- The level sensor in position number 3 is located approximately 33 inches above the bottom of the pump chamber. This position actuates high flow pump operation. Both pumps will operate concurrently when the water level exceeds this level control position. The pumps will continue to operate concurrently until the liquid level in the chamber descends to level control position number 1.

- The fifth level control (position number 4) sensor is located at approximately 4 feet above the bottom of the pump chamber. This level position serves as the high-high control set point. This position, if engaged, will enable the flashing beacon located at the top of each pump control panel. In addition, when the beacon is flashing an audible alarm will sound to alert UTES personnel that the pumping operation has experienced a fault condition or facility inflow is greater than the combined pump capacity (approximately 165 gpm). The reset button, located on the high-flow control panel face, can be pressed to acknowledge and silence the audible and flashing alarms.

The sensor levels can be manually adjusted to reflect a change in operating conditions, if necessary. Each pump can be operated in manual or automated mode by switching between the "hand" or "auto" operation, respectively, inside the control panel. Hand or manual operation is not recommended for long periods of operation, but should only be conducted if an operator is observing the liquid level in the pump chamber while commencing pumping or testing operations. Pumps operated in this manner should not be left unattended. The pumps can incur serious damage if operated under dry conditions.

9.3 MAINTENANCE

9.3.1 Pump Chamber

The pump chamber of the combined pump/sand trap sump should be cleaned on a quarterly basis or when warranted by inspection. Cleaning of the pump chamber should be conducted when the sediment trap bin is scheduled for cleaning or removal. Pump chamber cleaning can be accomplished by implementing the following procedures:

- Manually pump down the sump liquid level until the top of each pump is encountered.

- Implement lockout/tagout procedures to shutdown and/or isolate power sources for pumping operations. Lockout/tagout should be conducted as per OSHA 29 CFR 1910.147 and OSHA Standard 29 CFR 1910 Subpart S.

- Power wash clean the sidewalls of the pump chamber. This should only be conducted if the sediment trap bin is in place, and after the level control switches have been removed from the chamber.

- Use a vacuum truck and/or the UTES Facility's industrial grade compressed air shop vacuum to remove accumulated sediment and wash water from the chamber.

- The systems level controls must be reinstalled at their respective positions before resuming automated system operation.

All waste material recovered from this cleaning procedure should be transferred to the designated container for storage, testing, and disposal as instructed by the AZARNG EO.

9.3.2 Duplex Pump Cleaning

The pumps should be inspected and serviced according to the manufacturer's specifications as indicated in Appendix E. Pump removal and cleaning should be accomplished by implementing the following procedures:

- Lockout Tag-out of energy sources.

- Close the 4-inch-diameter Schedule 80 ball valve located on each discharge line.

- Disconnect the 2-inch-diameter true-union fitting located on each pump discharge riser.

- Facilitate pump removal by using the 3/16-inch support chain attached to the top of each pump. Due to the weight of each pump, a mechanical lifting device should be used for lifting the pump assemblies from the chamber.

- Exercise caution when removing each pump due to the tight clearance between the conveyance piping in which the pumps will have to vertically ascend and descend through during removal and resetting.

- The system operator should follow the manufacturer's recommended maintenance schedule and procedures.

9.4 SECTION REFERENCE ATTACHMENTS

- Drawing No. 6 - Sediment Trap / Sump Plan
- Drawing No. 7 - Sediment Trap / Sump Plan Sections And Details
- Drawing No. 13 - Electrical Site Plan
- Drawing No. 14 - Enlarged Electrical Site Plan
- Drawing No. 15 - Single Line Diagram
- Drawing No. 16 - Panel Board Schedule
- Drawing No. 17 - Electrical Specifications
- Appendix D - Manufacturer Literature - Level Control Sensor
- Appendix E - Goulds Pump Installation, Operations and Maintenance Manual
- Appendix F - Pump Control Interface – Manufacturer Shop Drawing
- Table 1 - Contact List / Emergency Information
- Table 5 - Checklist for Sediment Trap / Sump

10.0 OIL-WATER SEPARATOR

10.1 DESCRIPTION

The OWS is a gravity flow device incorporated into the system to provide pretreatment of industrial wastewater prior to offsite discharge. The OWS is a gravity-enhanced separator unit that separates oil and water according to Stoke's Law because of the difference in specific gravity between water and immiscible oil droplets. Manufacturer literature describes the separator as a unit designed for the removal of free-phase oil, grease, and settleable oily coated solids from oil-water mixtures.

The separator is a single-wall, aboveground unit that contains several prefabricated penetrations used for installing screw pipe conveyance piping for inflow receiving, product reservoir discharging, treated wastewater discharging, and venting. The separator dimensions are 12 feet (length) by 5 feet (width) and 5 feet (height). General manufacturer information is as follows:

- Manufacturer Name: Highland Tank
- Model No.: HTC 2000, Steel Construction
- Approximate Weight (Tare): 6,500 pounds
- Inlet/Outlet Diameter Penetrations: 8-inch
- Separator Access: Removable top covers with lifting handles

The separator includes component features such as a sludge hopper for retaining accumulated sludge, a parallel corrugated plate coalescer, and petro-screen coalescer for effective separation efficiency. The unit has a nominal capacity of 2,000 gallons with a spill capacity of 750 gallons, and is capable of treating 200 gpm to 10 parts per million (ppm) oil and grease discharge.

10.2 OPERATION

The OWS receives inflows from the duplex pump arrangement located in the pump chamber of the sand trap/pump sump. Inflows are distributed through the separator by gravity flow. Prior to distribution through the separator, inflows first encounter a velocity head diffusion baffle located in the primary chamber. The baffle reduces the velocity/turbulence of incoming flow and prevents sludge and/or sediment, if present in the wastewater, from carrying over into the separation process. Solids, sludge, and/or sediment present in the influent wastewater settle out in the sediment chamber and accumulate in the sludge hopper, allowing concentrated oil slugs to rise to the surface. Minor sediment/sludge accumulation is expected in this chamber due to the

installation of engineering controls (sediment bin and sediment trap) upstream of the pump chamber. An 8-inch-diameter blind flange provides access to the bottom of the sludge hopper.

The oily water then passes through the parallel-corrugated plate coalescer where oil rises and coalesces into sheets on the underside of each plate. The oil then creeps up the plate surface, and breaks loose at the top in the form of large globules. These globules then rise rapidly to the surface of the separation chamber where the separated oil accumulates. A coalescer mesh pak is used to intercept droplets of oil too small to be removed by the plate coalescer. The treated effluent then flows downward to the outlet downcomer, where it is discharged by gravity from the underflow of the separator. The effluent flows by gravity into an existing manhole downstream at a termination point shared with other UTES industrial/sanitary sewer wastewater outflows, eventually flowing to the Town of Florence, Public Owned Treatment Works (POTW) facility.

GENERAL NOTE

The effluent separator discharge consists of 4-inch-diameter piping that includes an inline 4-inch-diameter gate valve. The gate valve is to remain open under normal system operations.

A product skimmer removes reclaimed oil from the system and discharges by gravity to a 55-gallon reclaimed oil drum. The reclaimed oil drum is staged on a secondary containment pallet with a 66-gallon capacity. The reclaimed drum is equipped with a level sensor that actuates a flashing beacon and audible alarm when the liquid level in the drum reaches approximately 90 percent capacity (45 to 50 gallons). The flashing beacon is located on top of the local control panel interface, and the audible alarm is mounted to the panel. This alarm feature was incorporated into the system to alert UTES personnel when a high oil condition is present at the OWS, in which the reclaimed oil drum must be changed or pumped out immediately. If an alarm condition occurs, the operator should implement the following procedures:

GENERAL NOTE

No control interface exists between the duplex pump system and the sump high-high level alarm sensor. The alarm will only alert the AZAARG EO remotely by logic control, and locally alert UTES personnel with panel face alarms. The power source for this panel is provided by electric circuit breaker no. 3 located inside the LD panel.

- Shut down the duplex pump operation by turning each pump controller to the off position. This will stop further inflows to the system and prevent additional, if any, unwarranted discharges to the City of Florence POTW.

- Implement lockout tagout procedures and cease all activities that can generate inflows into the system.

- Completely close the pump chamber ball valves.

- Check the reclaimed oil drum and containment device to ensure that an overflow condition has not occurred. If an overflow condition has occurred, product may be present in the containment. If significant amount of product is present, the product should be sampled and removed in a regulatory manner by a licensed disposal company. Oil adsorbent media can be used for removing small quantity releases. Cleaning procedures should be implemented as approved by the AZAARG EO. It is not recommended to transport the containment structure when product is present in its spill reservoir. However, if the containment must be moved, it should be transported by forklift to the north wash rack and emptied into the rack's trench drain using the devices prefabricated drain assembly. Wash water should be used while draining the containment.

GENERAL NOTE

The level control sensor must be removed from the drum prior to removal. The 2-inch-diameter union must be disassembled to disconnect conveyance piping. Exercise caution when performing these tasks, since free-phase or residual product may be present in the piping, or on the level sensor. Lockout/Tagout procedures should be implemented, where applicable.

- Remove the drum from the spill containment device to accommodate a replacement drum.

- Place the removed drum in a staging area where it can be labeling, sampled, and/or await regulatory disposal. The drum should be removed with mechanical equipment outfitted with a drum lift or drum bridle manufactured specifically for drum handling.

- The previously removed level sensor must be reinstalled into the replacement drum to ready the system for operation.

- Upon completing drum replacement installation, the operator should remove the OWS effluent chamber cover to allow for inspection. The operator should observe if product is present in this chamber, to verify if a breakthrough condition has occurred within the separator and if product has been discharged to the City of Florence Sanitary System. The operator should immediately communicate this information to the AZARNG EO to determine if further action is required.

- If the AZARNG EO authorizes system operation, the operator can resume the pumping operation. The operator must remove lockout tagout devices and open the pump chamber ball valves. Then inside the pump control panels, switch the pump controller toggles to the auto position to reactivate the duplex pumping system.

GENERAL NOTE

A breakthrough condition indicates product may have passed through the separator's coalescing units. If this condition occurs, product may have impacted the OWS effluent chamber and may warrant internal cleaning of the OWS before resuming normal operation.

10.3 MAINTENANCE

Elevated concentrations of detergents and/or surfactants will reduce the efficiency of the OWS. UTES personnel should minimize the use of such cleaning agents and follow manufacturer's dilution rates. The OWS should be inspected bi-annually to evaluate internal accumulations of sediment and/or sludge. Inspection procedures should be conducted in the following manner:

- Shut down the duplex pumping system by switching the respective pump control toggles to the off position.

- Ensure that the facility ceases all operations that generate system inflows.

- Remove the separator covers using mechanical lifting equipment. Covers should be staged on a clean surface. Staging on unpaved surfaces may impact the underside of

the covers by allowing them to collect soil particulates or gravels. This condition could prevent the cover from seating flush to the separator structure when reinstalled.

- Inspect each separator chamber as per manufacturer recommendations included in Appendix F and per the checklist provided as Table 6.

- Clean the separator following manufacturer recommendations.

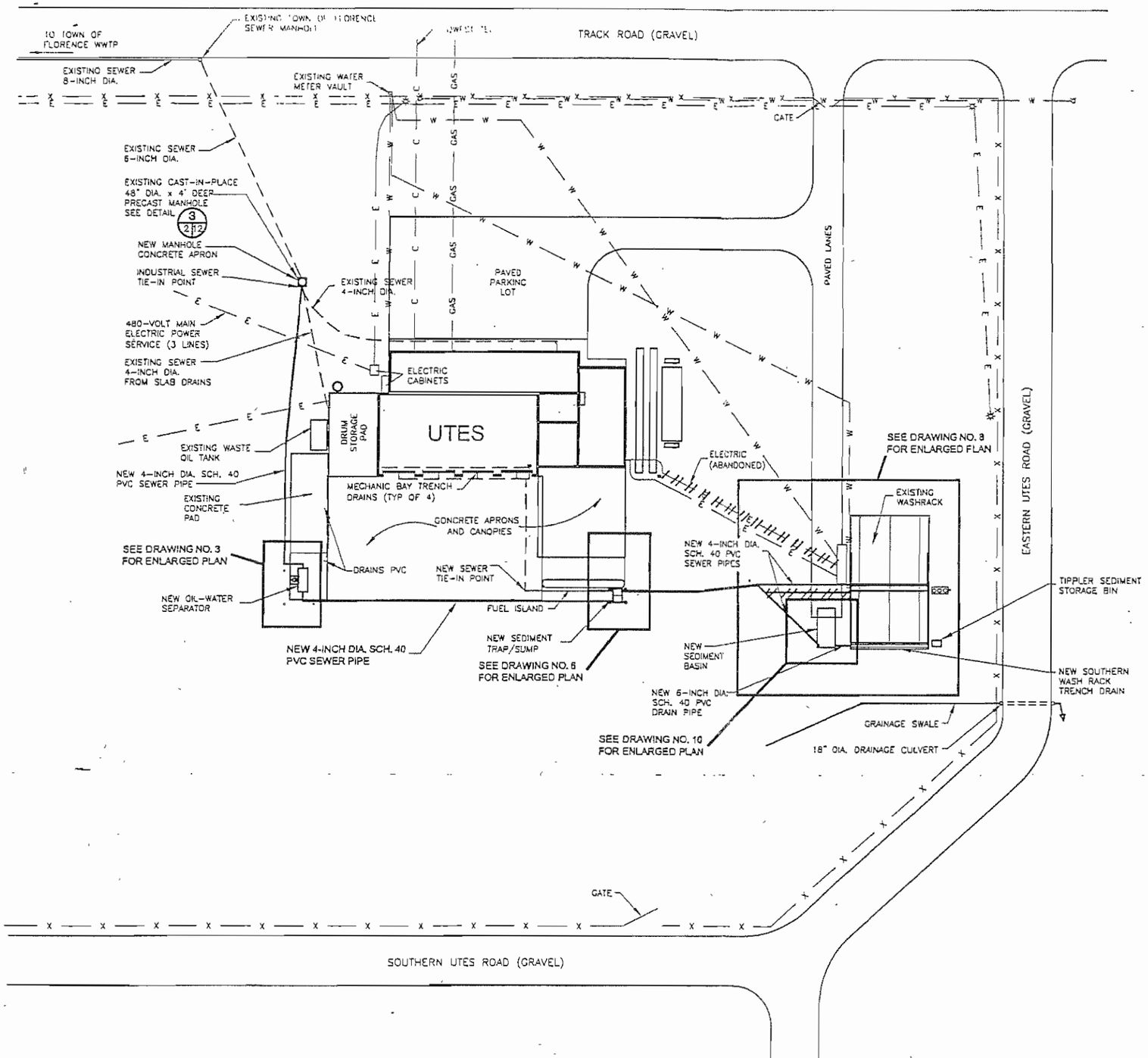
- Remove the parallel-corrugated plate coalescer and coalescer mesh pak and wash on the wash rack. The coalescers should be transported to the wash rack using some means of secondary containment in order to prevent reclaim oil from impacting site surface soils within the facility.

Removal of sediment and sludge accumulation should be completed annually, if necessary or when warranted by inspection.

10.4 SECTION REFERENCE ATTACHMENTS

- Drawing No. 3 - Oil-Water Separator Plan
- Drawing No. 4 - Oil-Water Separator Plan, Section and Details
- Drawing No. 5 - Oil-Water Separator Elevations
- Drawing No. I-1 – Pump Panels And Remote Monitoring System/OWS – Elementary Wiring Diagram, Taylor Controls
- Drawing No. I-2 - Pump Panels And Remote Monitoring System/OWS – Elementary Wiring Diagram, Taylor Controls
- Appendix G - Highland Tank Oil-Water Separator O&M Manual
- Table 5 – Checklist for Sediment Trap / Sump
- Table 6 – Checklist for Oil-Water Separator

LIST OF AS-BUILT CONSTRUCTION DRAWINGS



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LEGEND

- X — EXISTING FENCE LINE
- GAS — EXISTING SOUTHWEST GAS LINE
- E — EXISTING ELECTRIC LINE
- W — EXISTING WATER LINE
- C — EXISTING QWEST COMMUNICATION LINE
- SEWER — EXISTING SEWER LINE
- EXISTING POLE LIGHT
- EXISTING FIRE HYDRANT
- NEW INDUSTRIAL WASTE WATER LINE
- ABANDON/REMOVE UTILITY

"AS-BUILT"

CALL FOR ONE CALL SYSTEM 263-1100 1-800-STAKE-IT (ARIZONA BLUE STAKE, INC.)

REFERENCES TITLE	REFERENCES TITLE

REVISIONS NO.	BY	DATE	DESCRIPTION
1	KS	2/01	90% DESIGN SUBMITTAL
2	KS	2/01	100% PERMITTING AND CONSTRUCTION
3	KS	4/01	AS-BUILTS

REVISIONS NO.	BY	DATE	DESCRIPTION

SCALE:	AS NOTED	DATE
DESIGNED BY:	CDW	4-01
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CHECKED BY:	KRS	4-01
APPROVED BY:	CSW	4-01
CLIENT APPROVAL BY:		

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ARIZONA ARMY NATIONAL GUARD

SITE PLAN

ARIZONA ARMY NATIONAL GUARD	JOB NO. 29679-015-058
DESIGN AND IMPLEMENTATION OF INDUSTRIAL	DRAWING NO. 2 / REV. AB
WASTEWATER PRETREATMENT DEVICE	
(OIL-WATER SEPARATOR PROJECT FLORENCE, ARIZONA	

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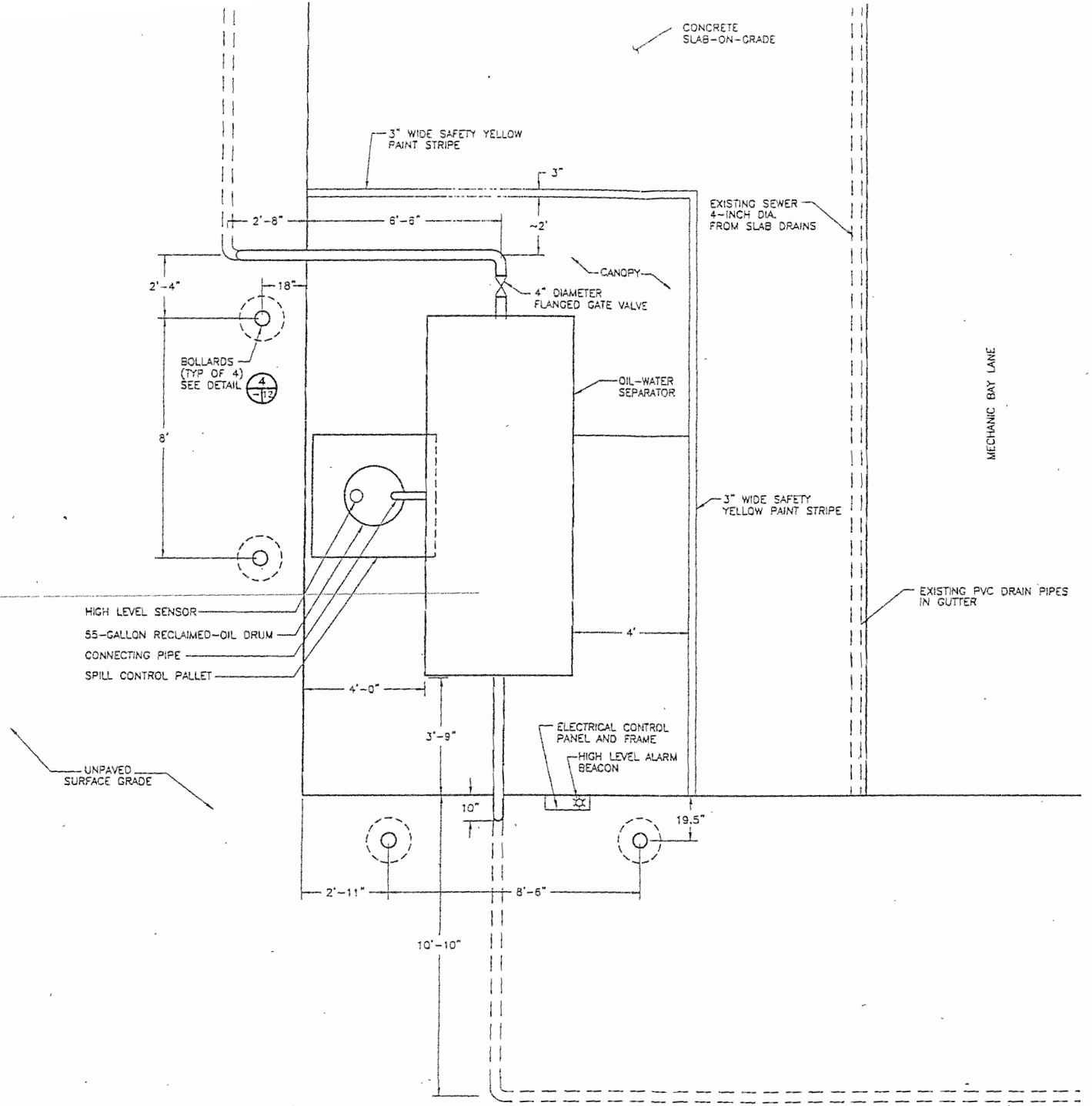

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"AS-BUILT"

263-100
1-800-STAKE-IT

10-10-02 XREF: SITEAREA.DWG

REFERENCES TITLE	REFERENCES TITLE

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2	KS	2/01	100% PERMITTING AND CONSTRUCTION
3	MB	10/02	AS-BUILTS REVISIONS

REVISIONS NO.	BY	DATE	DESCRIPTION

SCALE: AS NOTED		DATE
DESIGNED BY:	CDW	4-01
DRAWN BY:	KLP	4-01
CHECKED BY:	KRS	4-01
APPROVED BY:	CSW	4-01
CLIENT APPROVAL BY:		

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ARIZONA ARMY NATIONAL GUARD

OIL-WATER SEPARATOR PLAN

ARIZONA ARMY NATIONAL GUARD
DESIGN AND IMPLEMENTATION OF ... JOB NO. ...

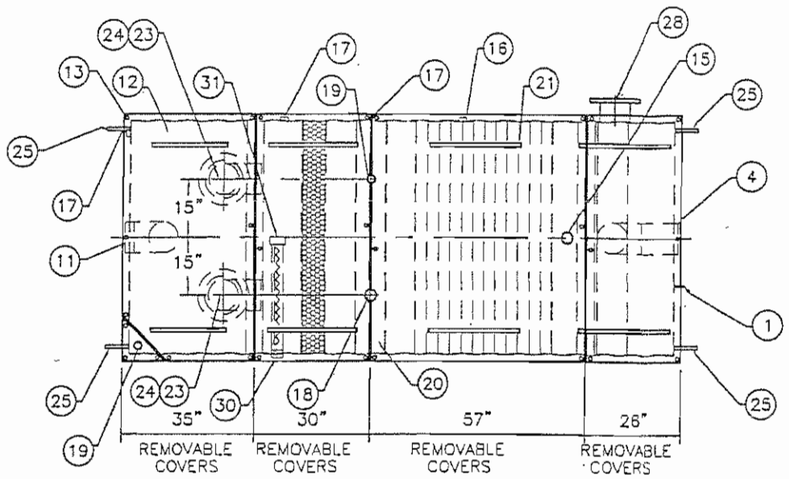
GENERAL SPECIFICATIONS

NO. REQ'D: (1)
CAPACITY: 2000 GALLONS
SPILL CAPACITY: 450 GALLONS
TYPE: RECTANGULAR, HTC, ABOVEGROUND, SINGLE WALL SLUDGE HOPPER
MATERIAL: MILD CARBON STEEL
APPROX. WEIGHT: 6100 LBS.
FLOW RATE: 200 GPM
GAUGE:
7 GA THROUGHOUT
SURFACE PREP:
SSPC NO.10 BLAST ALL INTERIOR SURFACES
SSPC NO.6 BLAST ALL EXTERIOR SURFACES

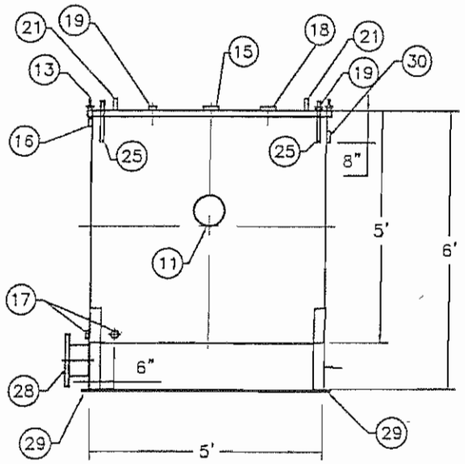
COATING:	MATERIAL	THICKNESS
EXTERIOR-	FINISH PAINT WHITE	(3 MILS)
INTERIOR-	HIGHCOTE	(15 MILS)

CONSTRUCTION:
BUTT FIT AND WELD ALL CORNERS IN & OUT

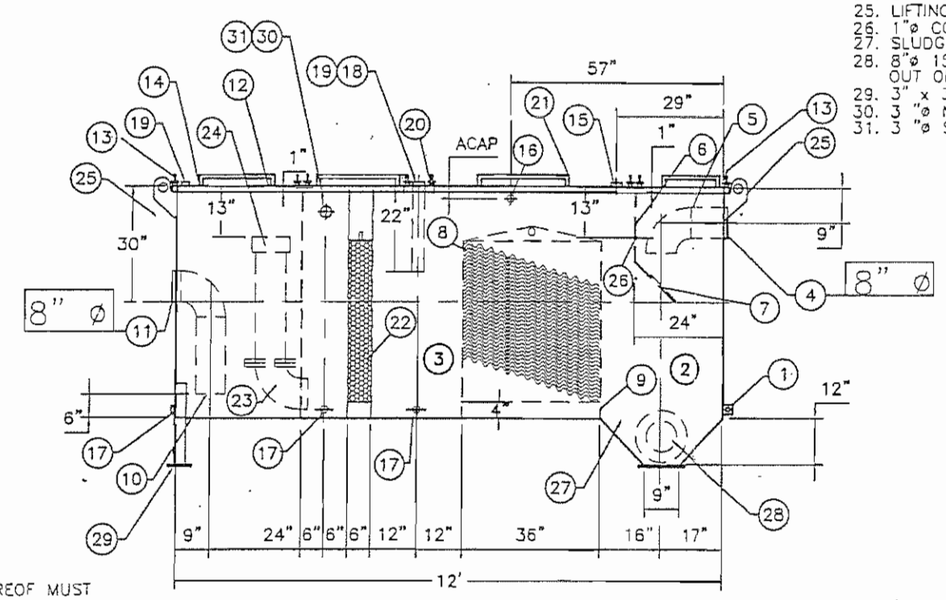
NOTE:
1. ALL INTERNAL MATERIAL IS 10 GA.
2. ALL FITTINGS MUST SHIP W/ STEEL PLUGS INSTALLED
3. LIFTING LUGS DO NOT HAVE REINFORCING PLATE



PLAN VIEW



END VIEW



ELEVATION

PROVIDED EQUIPMENT

1. 3"X3"X1/4" PLAT W/ 1/2"ø HOLE DRILLED IN CENTER (GROUNDING LUG)
2. SEDIMENT CHAMBER
3. OIL WATER SEPARATOR CHAMBER
4. THREADED INLET
5. PVC INLET ELBOW PIPING
6. VELOCITY HEAD DIFFUSION BAFFLE 10GA
7. WEAR PLATE (1/4" MATERIAL)
8. REMOVABLE PARALLEL CORRUGATED PLATE COALESCER (GALVANIZED) 1" PLATE SPACING
9. SLUDGE BAFFLE - 10GA
10. PVC OUTLET DOWNCOMER
11. THREADED OUTLET
12. REMOVABLE COVERS 4-REQUIRED (7 GA.)
13. NUTS & BOLTS W/ LARGE WING (CORROSION RESISTANT)
14. GASKET MATERIAL (FOR EACH REMOVABLE COVER)
15. 3"ø NPT (CLEAN-OUT)
16. 2"ø NPT (VENT)
17. 2"ø NPT (DRAIN)
18. 3"ø FULL COUPLING W/ 3" INTERNAL PVC PIPE
19. 2"ø NPT (FOR OIL LEVEL SENSOR)
20. 7GA. CROSSMEMBER FOR OIL PUMP-OUT & LEVEL SENSOR FTG.
21. HANDLES PER H.T. STANDARD
22. 6" THICK COALESCER MATERIAL
23. 8"ø STEEL ELBOW W/FLANGE WELDED TO TOP FOR PVC RISER PIPES
24. 8"ø ADJUSTABLE FERNCO COUPLING
25. LIFTING LUGS
26. 1"ø COUPLING W/ PLUG
27. SLUDGE HOPPER W/ BASE PLATE
28. 8"ø 150 # R.F.S.O. FLANGE FOR SLUDGE HOPPER CLEAN OUT ORAIN
29. 3" x 3" x 1/4" ANGLE LEGS W/ BASE PLATES
30. 3 "ø NPT (FTG. FOR SKIMMER)
31. 3 "ø SAWTOOTH SKIMMER

2000 GALLON OIL WATER SEPARATOR
RECTANGULAR, HTC, SINGLE WALL, SLUDGE HOPPER

APPLIED PROCESS EQUIPMENT INCORPORATED

FLORENCE A.N.G.
CAMP NAVAJO, AZ.

66336

3/8"=1'-0" 2-16-01 REM 010216 R-A

"AS-BUILT"

263-100 1-800-STAKE-IT

REFERENCES TITLE	REFERENCES TITLE

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1	KS	1/01	90% DESIGN SUBMITTAL
2	KS	2/01	100% PERMITTING AND CONSTRUCTION
3	KS	4/01	AS-BUILT

REVISIONS NO.	BY	DATE	DESCRIPTION

SCALE: AS NOTED		DATE
DESIGNED BY:	CDW	4-01
DRAWN BY:	KLP	4-01
CHECKED BY:	KRS	4-01
APPROVED BY:	CSW	4-01
CLIENT APPROVAL BY:		

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ARIZONA ARMY NATIONAL GUARD
OIL-WATER SEPARATOR PLAN, SECTION AND DETAILS (BY HIGHLAND TANK)

ARIZONA ARMY NATIONAL GUARD	JOB NO. 29679-015-058
DESIGN AND IMPLEMENTATION OF INDUSTRIAL	DRAWING NO. 4
WASTEWATER PRETREATMENT DEVICE	REV. AB
(OIL-WATER SEPARATOR PROJECT FLORENCE, ARIZONA	

25-01 REF:
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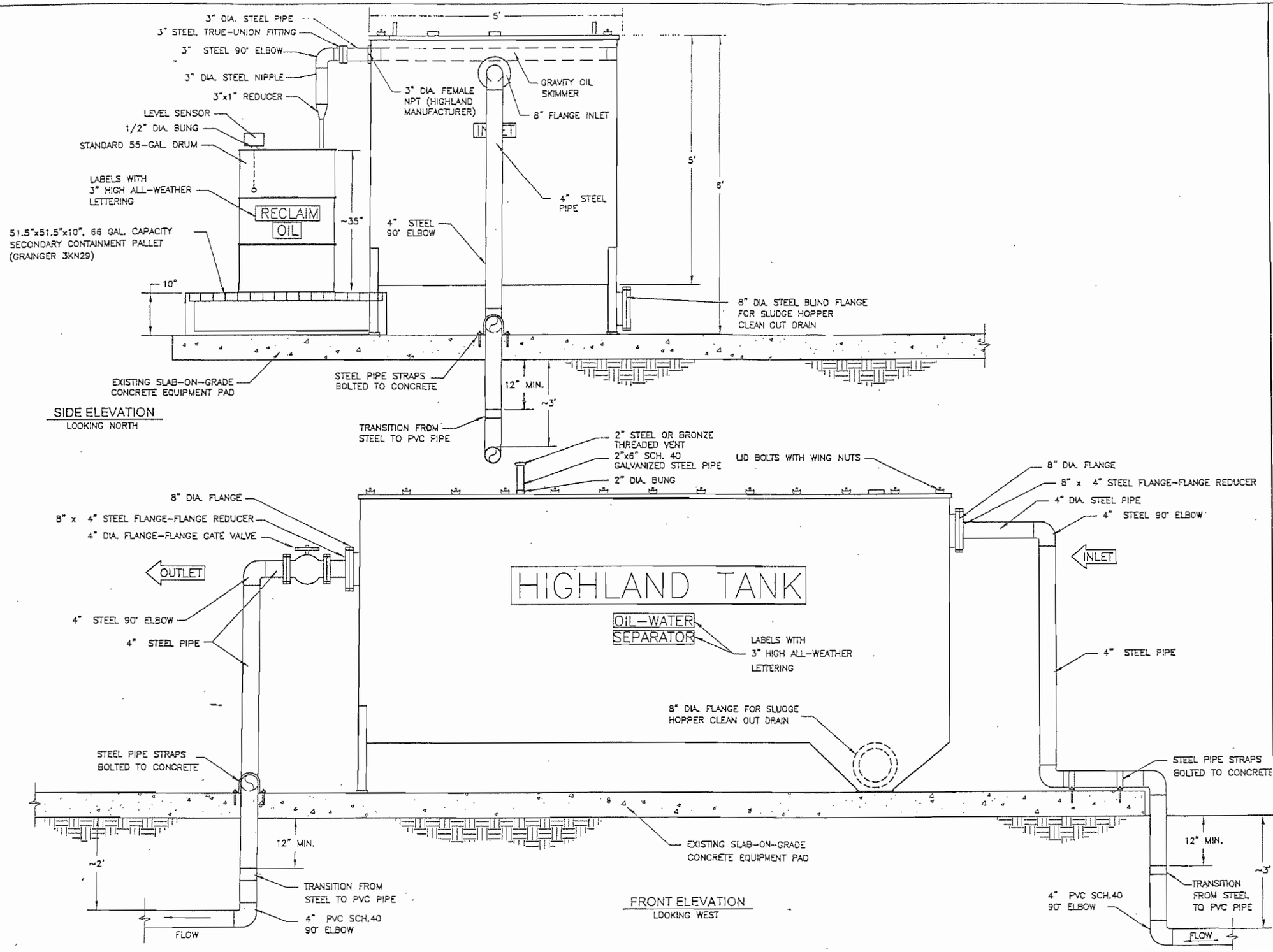

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GENERAL NOTES

1. THICKNESS, REBAR, AND STRUCTURAL CAPACITY OF EXISTING SLAB-ON-GRADE UNKNOWN.
2. ALL ABOVE GROUND PIPING IS SCHEDULE 40-CARBON STEEL MATERIAL.
3. ALL ABOVE GROUND PIPING IS PAINTED WITH INDUSTRIAL GRAY, OUTDOOR GRADE, METAL SURFACE GRADE PAINT.

LEGEND

CONCRETE

SUBGRADE

"AS-BUILT"

263-1100
1-800-STAKE-IT

REFERENCES TITLE	REFERENCES TITLE

REVISIONS NO.	BY	DATE	DESCRIPTION
1	KS	2/01	90% DESIGN SUBMITTAL
2	KS	2/01	100% PERMITTING AND CONSTRUCTION
3	MB	10/02	AS-BUILT REVISIONS

REVISIONS NO.	BY	DATE	DESCRIPTION

SCALE: AS NOTED		DATE
DESIGNED BY:	CDW	4-01
DRAWN BY:	MDH	4-01
CHECKED BY:	KRS	4-01
APPROVED BY:	CSW	4-01
CLIENT APPROVAL BY:		

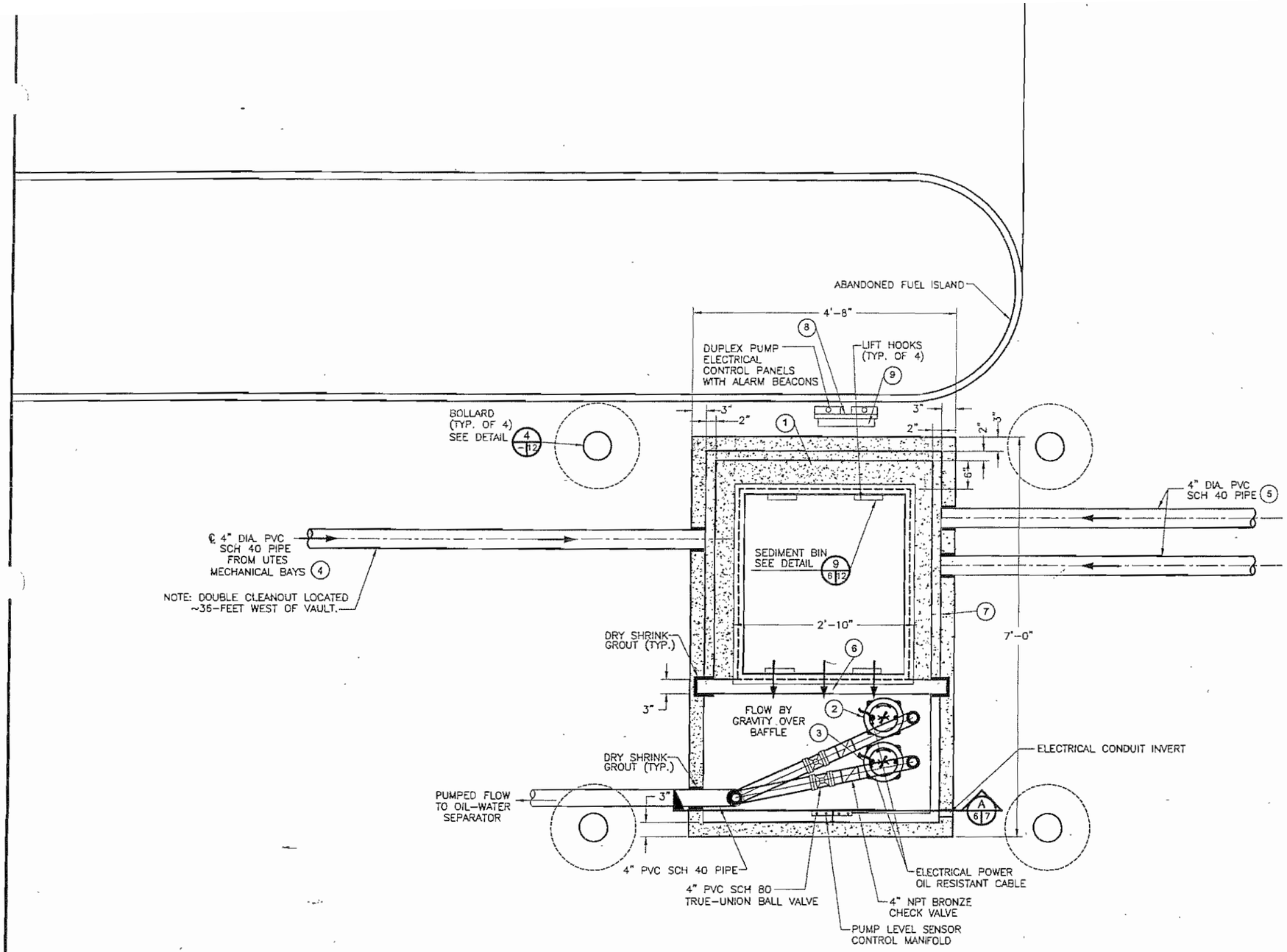
URS
7720 N. 16th Street Suite 100
Phoenix, Arizona 85020
(602) 371-1100

ARIZONA ARMY NATIONAL GUARD

OIL-WATER SEPARATOR ELEVATIONS

ARIZONA ARMY NATIONAL GUARD DESIGN AND IMPLEMENTATION OF INDUSTRIAL WASTEWATER PRETREATMENT DEVICE (OIL-WATER SEPARATOR PROJECT FLORENCE, ARIZONA	JOB NO. 29679-015-058	
	DRAWING NO. 5	REV. AB

\\25679\015\AS-Built.DWG 10-10-02



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0 1 2
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GENERAL NOTES

1. LOCATION OF AND CONNECTION CONFIGURATION TO THE EXISTING PIPING FROM THE UTES MAINTENANCE BAY TRENCH DRAINS TO BE FIELD VERIFIED.

KEY NOTES

(1) CONCRETE FILL TO TOP OF BAFFLE.

(2) SUBMERSIBLE SEWAGE LOW FLOW FLOW PUMP GOULDS MODEL# 3886, ORDER #WS0512B.

(3) HIGH FLOW PUMP GOULDS MODEL # 3887BHF, ORDER #WS1012BHF.

(4) PIPED FLOW FROM UTES MAINTENANCE BAY TRENCH DRAINS.

(5) PIPED FLOW FROM WASH RACK.

(6) PRECAST CONCRETE BAFFLES 2'-3" FROM INSIDE BOTTOM OF VAULT BY MANUFACTURER UTILITY VAULT COMPANY, INC.

(7) VAULT LID CLEAR OPENNING IS 36"x72".

(8) PUMP CONTROL PANELS AND REMOTE MONITORING CONTROL PANEL ARE SUPPORTED BY A COMMON FRAME

(9) REMOVE OFF-SITE MONITORING PANEL

LEGEND

CONCRETE

"AS-BUILT"

CALL FOR THE BLUE STAKE 263-1100 1-800-STAKE-IT OUTSIDE MARICOPA COUNTY

10-24-02

29679\DWG\XS\XS-BUILT.DW

REFERENCES TITLE	REFERENCES TITLE

REVISIONS NO.	BY	DATE	DESCRIPTION
4	KS	2/01	90% DESIGN SUBMITTAL
5	KS	2/01	100% PERMITTING AND CONSTRUCTION
6	KS	10/02	AS-BUILT REVISIONS

REVISIONS NO.	BY	DATE	DESCRIPTION

	SCALE: AS NOTED	DATE
DESIGNED BY:	CDW	4-01
DRAWN BY:	KLP	4-01
CHECKED BY:	KRS	4-01
APPROVED BY:	CSW	4-01
CLIENT APPROVAL BY:		

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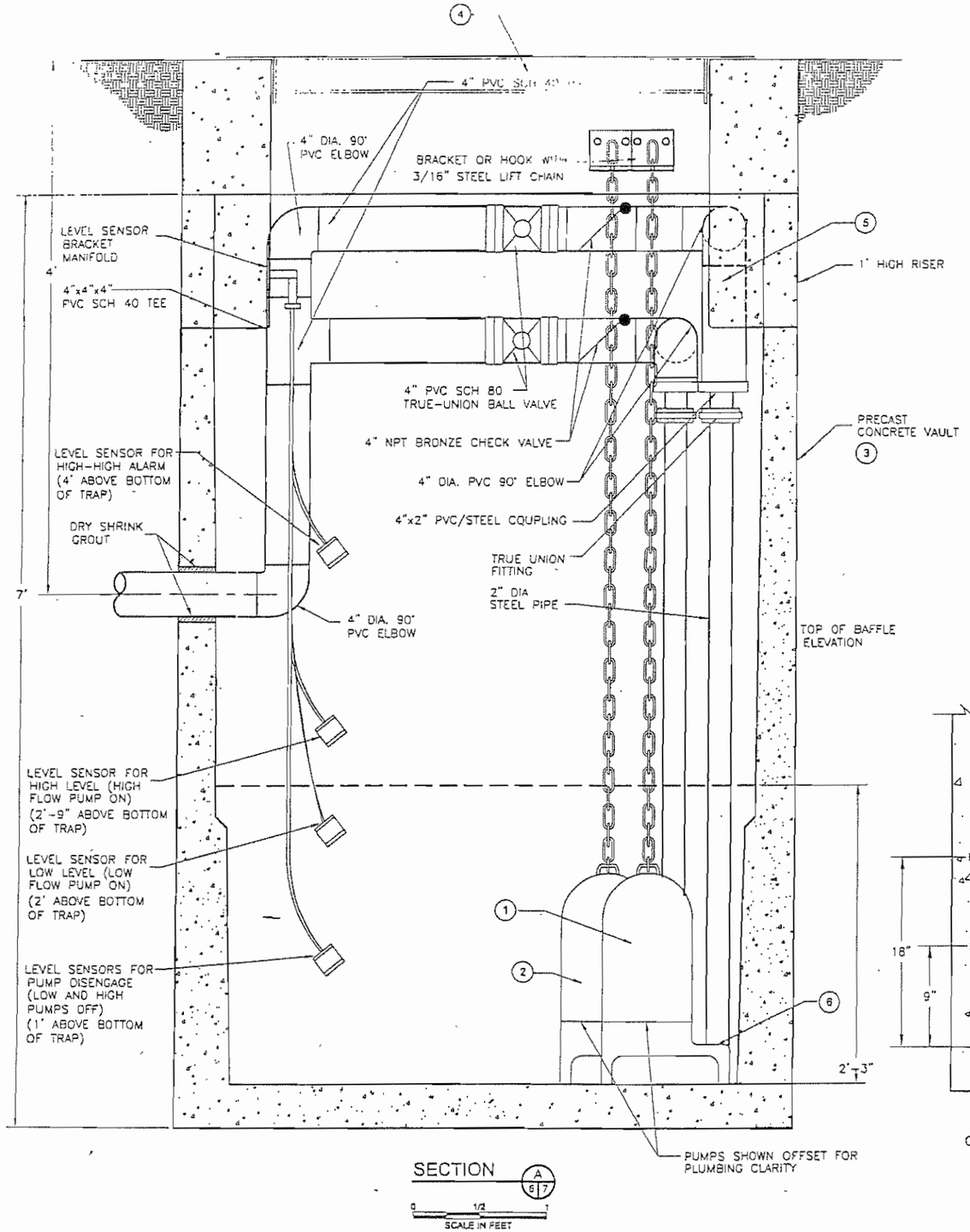
ARIZONA ARMY NATIONAL GUARD

SEDIMENT TRAP/SUMP PLAN

ARIZONA ARMY NATIONAL GUARD	JOB NO. 29679-015-058	
DESIGN AND IMPLEMENTATION OF INDUSTRIAL	DRAWING NO.	REV.
WASTEWATER PRETREATMENT DEVICE	6	AB
(OIL-WATER SEPARATOR) PROJECT FLORENCE, ARIZONA		



SECTION A 6|7

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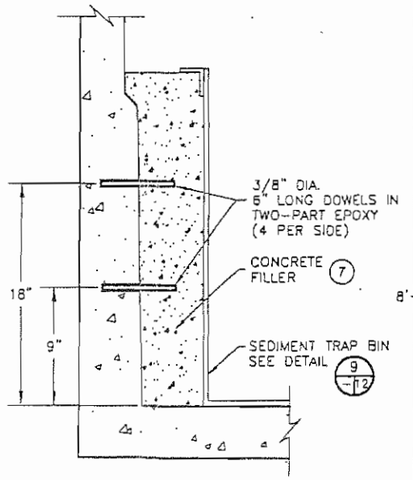

CONCRETE FILLER DETAIL 2|7

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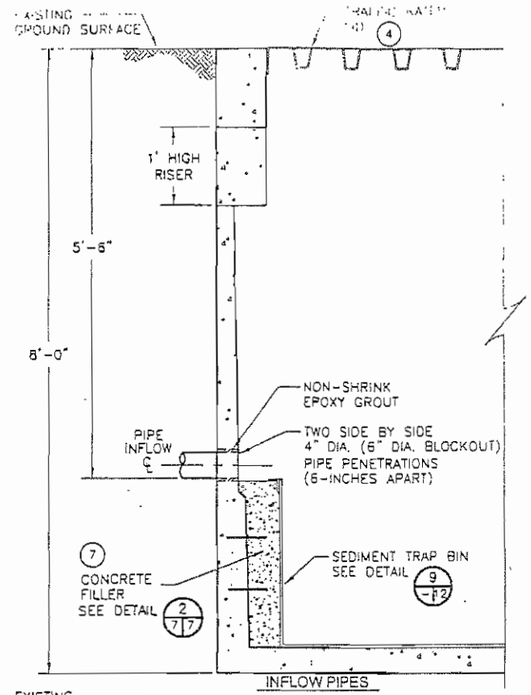
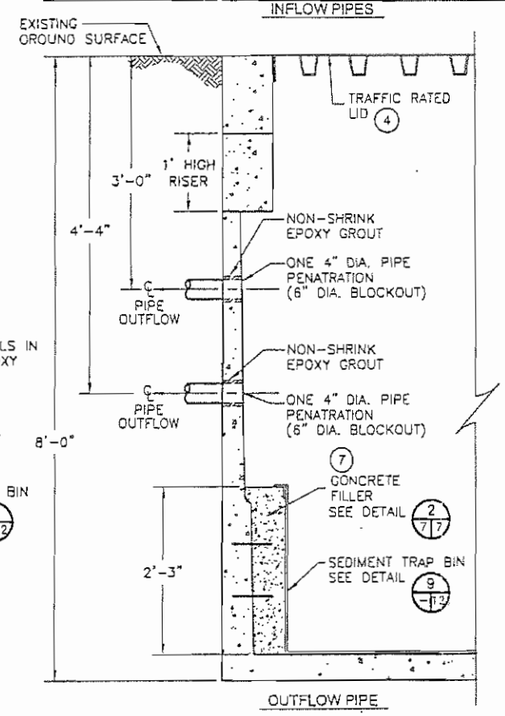


INFLOW PIPES



OUTFLOW PIPE

PIPE PENATRATION DETAILS 1|7

0 1 2
SCALE IN FEET

KEY NOTES

1. SUBMERSIBLE SEWAGE LOW FLOW PUMP, GOULDS MODEL #3886, ORDER #WS0512B.
2. SUBMERSIBLE SEWAGE HIGH FLOW PUMP, GOULDS MODEL #3887BHF, ORDER #WS1012BHF.
3. PRECAST SEDIMENT TRAP/SUMP VAULT MODEL# 577-5A UTILITY VAULT COMPANY, INC.
4. DOUBLE TORSION DOORS CATALOG NO. 3672 UTILITY VAULT COMPANY, INC.
5. UNISTRUT BRACING AS REQUIRED TO MAINTAIN VALVES AND TRUE-UNION NEAR SURFACE.
6. PUMP INTAKE ELEVATION 3" (7'-6" BGS) FROM INSIDE BOTTOM OF SUMP.
7. CAST-IN-PLACE CONCRETE FILLER

LEGEND

- CONCRETE
- NON-SHRINK GROUT
- SUBGRADE

"AS-BUILT"

Call for the blue stakes 263-1100 1-800-STAKE-IT (outside Maricopa County)

REFERENCES TITLE	REFERENCES TITLE

REVISIONS NO.	BY	DATE	DESCRIPTION
1	KS	1/01	90% DESIGN SUBMITTAL
2	KS	2/01	100% PERMITTING AND CONSTRUCTION
3	MB	10/02	AS-BUILT REVISIONS
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REVISIONS NO.	BY	DATE	DESCRIPTION
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SCALE:	AS NOTED
DESIGNED BY:	CDW
DRAWN BY:	KLP
CHECKED BY:	KRS
APPROVED BY:	CSW
CLIENT APPROVAL BY:	
DATE	4-01
DATE	4-01
DATE	4-01
DATE	4-01

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Phoenix, Arizona 85020
(602) 371-1100

ARIZONA ARMY NATIONAL GUARD

SEDIMENT TRAP/SUMP SECTIONS AND DETAILS

ARIZONA ARMY NATIONAL GUARD	JOB NO. 29679-015-058	
DESIGN AND IMPLEMENTATION OF INDUSTRIAL WASTEWATER PRETREATMENT DEVICE (OIL-WATER SEPARATOR PROJECT FLORENCE, ARIZONA	DRAWING NO 7	REV AB

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ATTACHMENT 3.

ADDITIONAL INSTRUCTIONS FOR FLORENCE UTES SEPARATOR

The sediment trap alone has a storage volume of approximately 18 cubic feet or 135 gallons. The trap will more than likely contain saturated sediment and the pump chamber will mainly contain water with bottom sludge. If the pumps are operating according to design the pump chamber should only contain approximately 105 gallons since the storage volume is approximately 14 cubic feet. The below grade vault which includes the sediment trap and pump chamber has a combined total approximate storage capacity of 1,000 gallons. That is if the pumps had failed and the vault was allowed to fill.

Basically if the system is operating as intended...

The approximate volume that may be anticipated from the sediment trap/pump chamber would be 240 gallons and you should anticipate removing at least 2,000 gallons from the OWS during a clean out. Keep in mind these values are approximate and do not include wash water from cleaning activities that may add to the volume removed.

Note: I believe that during the training we recovered an approximate volume of 200 gallons of liquid and accumulated sediment/sludge material from the sediment trap and pump chamber. This material was generated as a result of approximately 1.5 years of system operation.

For estimating purposes you may want to anticipate using an additional 200 to 250 gallons of wash water during cleaning and should anticipate recovering approximately 3,000 gallons from a full clean-out of the OWS and sediment trap/pump chamber vault.

Cleaning events including pressure washing and vacuum pumping (preferably conducted with a vacuum truck) will more than likely be needed at the sediment trap/pump chamber (vault) and the above grade oil water separator unit. Since the vault is a confined space, it would be best to perform cleanout activites from grade surface.

Implementing vacuum pumping when needed at the site would be beneficial to system operators and the system operation. The vacuum pumping and pressure washing of system devices should be performed concurrently.

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ATTACHMENT 4.

OPERATIONS AND MAINTENANCE MANUAL

OIL-WATER SEPARATOR SYSTEM
CAMP NAVAJO OMS#6
BELLEMONT, ARIZONA

Prepared for:

ARIZONA ARMY NATIONAL GUARD (AZARNG)

Prepared by:

SCS ENGINEERS

SCS Project No. 10.201018.01
March 5, 2003

TABLE OF CONTENTS

LIST OF TABLES

LIST OF PHOTOGRAPHS

LIST OF DRAWINGS

LIST OF APPENDICES

SECTION 1
INTRODUCTION

1.1 PURPOSE AND SCOPE

SCS Engineers (SCS) has prepared this Operations and Maintenance (O&M) Manual on behalf of the Arizona Army National Guard (AZARNG) to provide procedures and/or practices for operating and maintaining the Oil-Water Separator (OWS) located at the OMS #6 facility at Camp Navajo in Bellemont, Arizona.

The Separator was designed and installed by SCS to replace a previously existing OWS. The new OWS is located south of OMS #6 and consists of a dual-walled underground unit with leak detection and high alarm sensors. The OWS receives discharge from the floor drains in the OMS maintenance bay area; this discharge is delivered to the OWS through pre-existing floor drains and piping that was re-routed around the old separator.

1.2 SECTION REFERENCE ATTACHMENTS

Drawing No. 1 - Site Plan

SECTION 2
SYSTEM INFLOWS AND PROCESS DESCRIPTION

2.1 INDUSTRIAL WASTEWATER

The OWS receives industrial wastewater from directly from floor drains in the maintenance bay portion of the OMS #6 building. The system is not designed for storm water runoff or other types of inflows.

Industrial wastewater is generated from vehicle and equipment maintenance activities that occur in the maintenance bay area of the OMS #6 building. Discharges are primarily associated with washing of the floors in the maintenance bay area.

Fluids resulting from vehicle maintenance and floor cleaning in the maintenance bays drain to trench drains located along the east and west edges of the maintenance bay portion of the building. Each trench drain is emptied by several two-inch diameter drains located in the approximate center of each of the maintenance bay doorways. These drains are marked by a faint yellow arrow painted on the concrete near the inside edge of the trench drains. The drains contain a screen insert that traps items larger than approximately one-quarter inch in diameter.

Fluids drain by gravity from the trench drains, through the screened two-inch drains, into existing subgrade conveyance piping, and into the newly installed OWS. The OWS separates oil and sediment from the inflow, and the resulting outflow discharges to the on-site wastewater treatment plant. Fluids draining to the OWS from the maintenance bay area can be impacted with petroleum constituents, solvents, degreasing agents, and/or surfactant residuals used in performing maintenance/cleaning activities.

2.2 SEDIMENT

Sediment can enter the system through the trench drains and the screened two-inch drains. The source of this sediment should be limited to that generated by washing of floors in the maintenance bay area.

2.3 SECTION REFERENCE ATTACHMENTS

Drawing No. 1 - Site Plan
Photograph No. 15 - Trench Drain in Western End of Maintenance Bay Area

SECTION 3
OPERATION AND MAINTENANCE OF SYSTEM COMPONENTS

The operation and maintenance of components is essential for maintaining effective system operation and efficiency. Accumulations of grit, sediment, sludge, debris, and inorganic intrusive matter can affect the overall performance of the system. Periodic inspection and preventive maintenance activities should be performed to reduce the accumulation of such matter to ensure proper function of the OWS and associated piping.

SECTION 4
MECHANIC BAY FLOOR DRAINS

4.1 DESCRIPTION

The OMS #6 facility has four indoor maintenance bays which are accessible from either the east or the west through roll-up doors. Bays are sloped to the east and west towards grated trench drains located just inside the doorways. The drains collect wash water, sediment, oil, and grease from maintenance activities and associated floor cleaning conducted at the facility. The trench drains empty through two-inch diameter drains with screen inserts to subgrade 4-inch-diameter piping that drains to the southwest corner of the maintenance bay area, and from that point south to the new OWS.

The locations of the two-inch drains within the trench drains are marked by a faint yellow arrow painted on the concrete near the inside edge of the trench drains. The drains contain a screen insert that traps items larger than approximately one-quarter inch in diameter.

4.2 OPERATION

The trench drains capture liquids and sediment from the maintenance bay area floor. Sediment settles to the bottom of the trench drains, and objects such as nuts and bolts are trapped by the screens on the small drains within the trench drains. Liquid gravity-flows through the smaller drains to piping that leads to the OWS.

As shown on the As Built drawings, piping between the trench drains and the OWS is a combination of existing and new piping. Existing piping consists of 4-inch diameter cast iron pipe that extended from the trench drains to the abandoned separator inlet, and 4-inch vitrified clay pipe (VCP) extended from the abandoned separator outlet to the sewer main that parallels the road south of the OMS building. The existing cast iron piping was cut point approximately 6 feet south of the southwest corner of the maintenance bay area, and new 4-inch diameter ABS piping was installed between that pint and the new OWS inlet. 4-inch ABS also extends from the new OWS outlet to the existing VCP sewer line. All flows from the trench drains through the new OWS and to the sanitary sewer system are gravity-driven.

4.3 MAINTENANCE

The trench drains should be inspected weekly to determine whether sediment or debris have collected in the vicinity of the smaller screened drains within the trench drains. If material has collected in this area, the trench drains should be cleaned by hand shoveling with a flat shovel. The drain screens should remain in place during cleaning to prevent the entry of sediment and debris into the underlying piping. Once this material has been removed with a shovel, the screens can be removed, brushed free of debris, and replaced. Waste material from drain cleaning activities should be stored in 55-gallon drums, or other appropriated containment vessels designated for use by the AZARNG EO. This material must be properly characterized and disposed of as directed by AZARNG EO.

If the trench drains and debris screens area cleaned but the drains will not empty, the underlying conveyance piping may be clogged or obstructed with grit particles, sediment, sludge, or debris. The facility operator should implement the following procedures to flush the maintenance area trench drain piping:

- Open the OWS as described in Section 5.3.1 so that the liquid surface in the separator can be observed.

- Identify at least one of the smaller drains within the trench drain and remove the screen. Place one of the hoses located in the maintenance bay area into the drain and apply full hose pressure.

- Return to the OWS and observe the liquid surface in the separator for ripples, bubbles, and other indications of flow into the OWS. If no discharge is visible, move the hose to other drains within the trench drains to determine whether the blockage is beneath the trench drains or at a point downstream.

- If introduction of water is unsuccessful in clearing the blockage, a flat sewer snake may be used to clear the pipe from one of the smaller drains in the trench drains, or it may be necessary to retain a licensed contractor to clear the blockage.

4.4 SECTION REFERENCE ATTACHMENTS

Table 1 - Checklist for Maintenance Bay Area Trench Drains
Drawing No. 1 - Site Plan
Photograph No. 8 - Interior of oil water at normal operating level
Photograph No. 15 - Trench drain in western end of maintenance bay area
Photograph No. 16 - Trench drain detail

SECTION 5
OIL-WATER SEPARATOR

5.1 DESCRIPTION

The OWS is a gravity flow device that provides pretreatment of industrial wastewater prior to discharge to the Camp Navajo wastewater treatment plant. The OWS is designed to remove free oils and grease by using a series of baffles, parallel plates, and a polypropylene matrix to separate oil and water based on the difference in specific gravity between water and immiscible oil droplets.

The separator is an underground, dual-wall unit with a leak detection probe located between the two walls, and a high oil level sensor in the main chamber. The entire unit is steel, protected with exterior GLASTEEL® corrosion protection system. The main chamber of the OWS measures 8 feet long by 3.5 feet tall, with a manway extending 3 feet above the main chamber.

General manufacturer information is as follows:

Manufacturer: PS International, Inc.
Model No.: PSC-550-DW-J
Construction: 10-gauge carbon steel inner vessel, fiberglass corrosion protection coating
Total Capacity: 550 gallons
Oil Capacity: 140 gallons
Flow Rate: 80 gallons per minute
Performance: 100 parts per million or less free oil in effluent
Approximate Weight: approximately 2,200 pounds
Inlet/Outlet Diameter: 4 inches
Separator Access: Manway enclosed by standard traffic rated manhole cover

The separator includes the following features:

- A single corrugated plate separator.
- A parallel plate pack separator.
- A sludge baffle.
- A polypropylene coalescer matrix within a stainless steel frame.
- A high oil level float sensor that sounds an alarm when approximately 140 gallons of oil has accumulated.
- A leak detection sensor that sounds an alarm when fluid is present between inner and outer vessels.

5.2 OPERATION

The OWS receives influent by gravity flow from the OMS #6 maintenance bay area. Influent is first directed over a single corrugated plate separator, which is set perpendicular to the flow stream. This inlet plate reduces the influent flow velocity and disperses the flow out over the cross-sectional area of the separator. Flow patterns cause solids to drop from the flow, and oil

droplets to collide and coalesce.

Influent then flows over a parallel plate pack, consisting of several corrugated steel plates inclined so that solids drop from the plates to the bottom of the separator chamber, where they collect behind a sludge baffle. The sludge baffle is located so that sludge collects beneath the manway opening for easy removal. The sludge baffle also creates vertical flow components that aid in the flotation of oil droplets.

The final stage of treatment occurs when liquid passes through a polypropylene coalescer unit. This unit consist of bundled plastic mesh of varying fiber sizes that can trap oil droplets down to 20 microns in size. The coalescer is situated between two tracks, so it can be easily removed and cleaned.

The treated effluent then flows to the OWS outlet, where it is discharged by gravity flow into the existing sanitary sewer pipeline that leads to the Camp Navajo Wastewater Treatment Plant.

A high oil level float sensor that sounds an alarm when approximately 140 gallons of oil has accumulated. The operation of this unit is described in Section 6.1. Section 6.2 includes a description of the OWS leak detection system.

5.3 MAINTENANCE

Elevated concentrations of detergents and/or surfactants will reduce the efficiency of the OWS. On-site personnel should minimize the use of such cleaning agents and follow manufacturer's dilution rates.

5.3.1 Inspection

The OWS should be inspected monthly to evaluate internal accumulations of oil and sediment/sludge. Inspection procedures should be conducted in the following manner:

- To access separator, remove manhole cover and steel cover plate from separator access manway. The steel cover plate should be staged on a clean surface so that it does not collect soil particulates or gravel that could prevent the cover from seating flush to the separator structure when reinstalled.

- Visually observe the liquid in the separator to verify that the operating level is normal. Normal operating level is just above the base of the manway, or approximately 30 inches below the top of the manway as measured with a tape measure or measuring stick.

- Use interface probe or oil-detecting paste on the measuring stick to check the thickness of the oil layer in the OWS.

- Use the measuring stick to probe the bottom of the separator just upstream of the coalescer unit. The location of the coalescer can be confirmed by lifting the metal handle that leans against the inside of the manway a few inches. The stick should be gently

lowered to the bottom of the OWS and moved back and forth to determine whether there is accumulated sediment or sludge.

- Use the measuring stick to GENTLY push the ball float down along the stainless steel rod within the manhole. This should activate the alarm bell inside the OWS maintenance bay area. It may be necessary to have another person inside the OMS #6 maintenance bay area listen for the alarm.

5.3.2 Cleaning

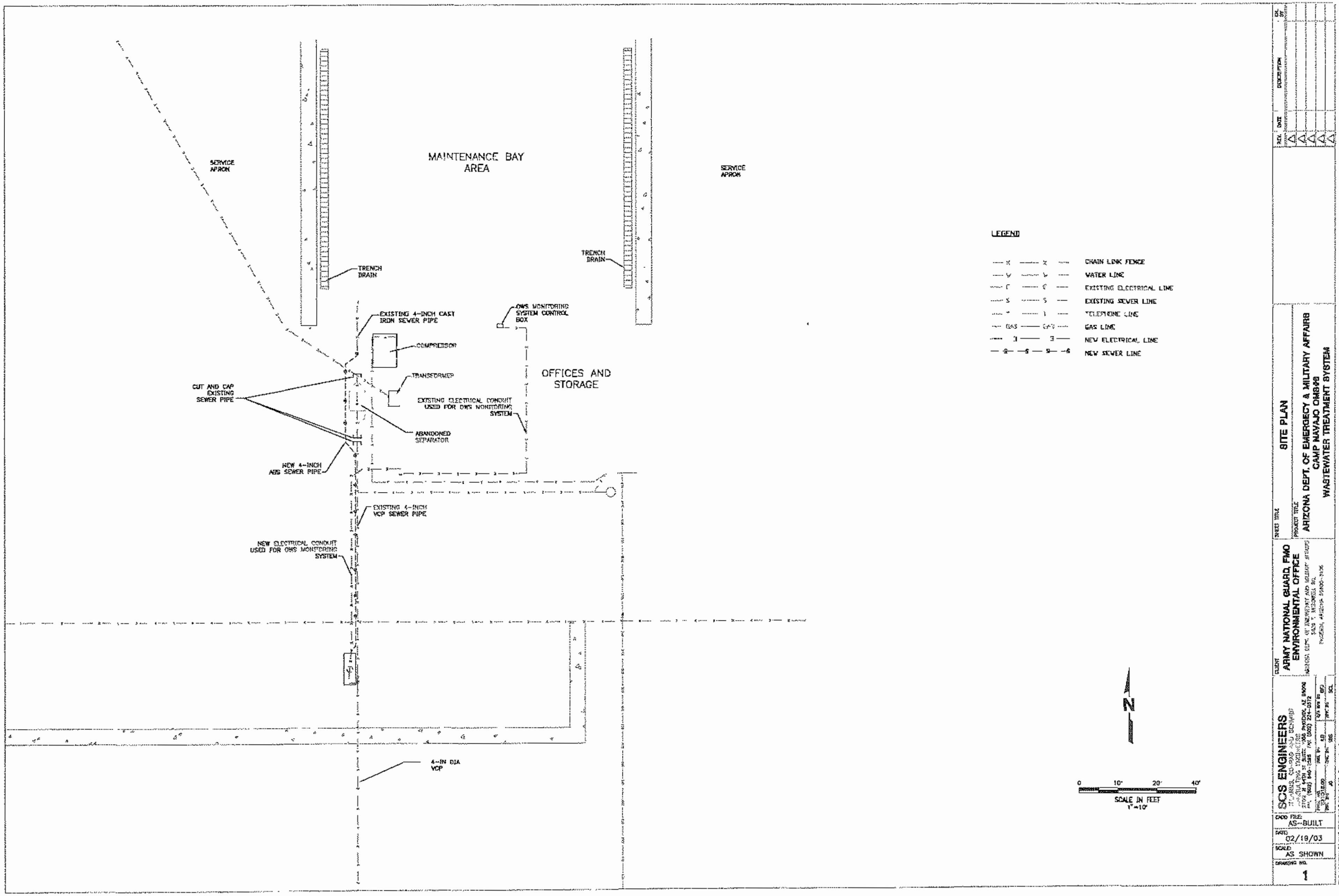
When inspection indicates that oil and/or sludge should be removed, the following procedures applies:

- Ensure that the facility ceases all operations that generate inflows to the OWS.
- Access the separator as described above.
- To remove only oil, use vacuum truck or self-priming pump to skim oil from the surface of the liquid until only a sheen remains.
- To remove all liquids and associated sludge, remove coalescer unit from the access manway using the handle provided, and set aside. Use vacuum truck or self-priming pump to remove all liquids. NOTE THAT REMOVING LIQUID FROM THE SEPARATOR MAY ACTIVATE THE HIGH OIL LEVEL ALARM. The alarm bell can be temporarily silenced by depressing the Silence pushbutton on the control panel.
- If sludge or solids are present in the bottom of the tank, they should accumulate upstream of the sludge baffle, which is located on the upstream side of the coalescer unit. If necessary, use a stream of water (hoses located in OMS #6 maintenance bay area) to agitate and break up solids during removal. Replace coalescer.
- SEPARATOR MUST BE REFILLED WITH WATER TO NORMAL OPERATING LEVEL AFTER OIL HAS BEEN REMOVED OR THE SEPARATOR HAS BEEN EMPTIED. This can be achieved by either running water into the trench drain in the maintenance bay area, or placing a hose directly into the separator unit. The normal operating level is a few inches above the base of the access manway, or approximately 30 inches below the top of the manway.
- Liquids and sediment/sludge removed from the OWS must be properly containerized, characterized, and disposed of as directed by AZARNG EO.

5.4 SECTION REFERENCE ATTACHMENTS

Table 2 - Checklist for Oil-Water Separator
Drawing No. 2 - Oil-Water Separator Plan, Section and Details
Photograph No. 6 - Manway cover for access to oil water separator interior

Photograph No. 7 - Interior of oil water separator when empty
Photograph No. 8 - Interior of oil water at normal operating level
Photograph No. 9 - Interior of oil water at normal operating level, coalescer partially withdrawn to show guide tracks
Photograph No. 10 - Coalescer unit, removed from oil water separator
Photograph No. 11 - South wall of maintenance bay area, monitoring system control panel
Photograph No. 12 - Monitoring system control panel
Photograph No. 15 - Trench drain in western end of maintenance bay area
Photograph No. 16 - Trench drain detail
Appendix B - Manufacturer's Literature for OWS Installation, Operation, and Maintenance



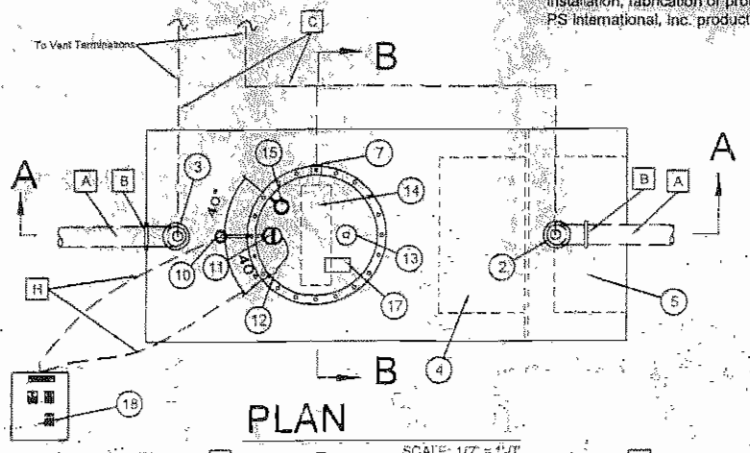
SERVICE APRON
MAINTENANCE BAY AREA
SERVICE APRON
TRENCH DRAIN
TRENCH DRAIN
EXISTING 4-INCH CAST IRON SEWER PIPE
OWS MONITORING SYSTEM CONTROL BOX
COMPRESSOR
TRANSFORMER
OFFICES AND STORAGE
EXISTING ELECTRICAL CONDUIT USED FOR OWS MONITORING SYSTEM
CUT AND CAP EXISTING SEWER PIPE
ABANDONED SEPARATOR
NEW 4-INCH ABS SEWER PIPE
EXISTING 4-INCH VCP SEWER PIPE
NEW ELECTRICAL CONDUIT USED FOR OWS MONITORING SYSTEM
4-IN DIA VCP
LEGEND
CHAIN LINK FENCE
WATER LINE
EXISTING ELECTRICAL LINE
EXISTING SEWER LINE
TELEPHONE LINE
GAS LINE
NEW ELECTRICAL LINE
NEW SEWER LINE
N
0 10' 20' 40'
SCALE IN FEET
1"=10'
REV. DATE DESCRIPTION
SHEET TITLE
SITE PLAN
PROJECT TITLE
ARIZONA DEPT. OF EMERGENCY & MILITARY AFFAIRS
CAMP NAVAJO OMS#8
WASTEWATER TREATMENT SYSTEM
CLIENT
ARMY NATIONAL GUARD, FMO
ENVIRONMENTAL OFFICE
SCS ENGINEERS
CADD FILE: AS-BUILT
DATE: 02/19/03
SCALE: AS SHOWN
DRAWING NO. 1

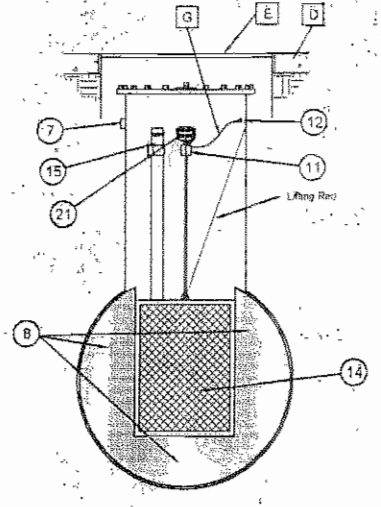
SPECIFICATIONS

MODEL: PSC-550-DW-J
Separator Volume: 550 Gallons
Flow Rate: 80 GPM Non-Emulsified Gravity Flow
Oil Storage: 150 Gallons Recommended
Performance: 10 ppm or less free oil in effluent
Construction: 10 Guage Carbon Steel Inner Vessel with UL-1746 Listed Fiberglass Outer Jacket
Interior Coating: Tnemec Series 61
Exterior Coating: Fiberglass per UL-1746 Corrosion Protection System w/ 30 Year Warranty
Separator Weight: ~2,200 lbs.

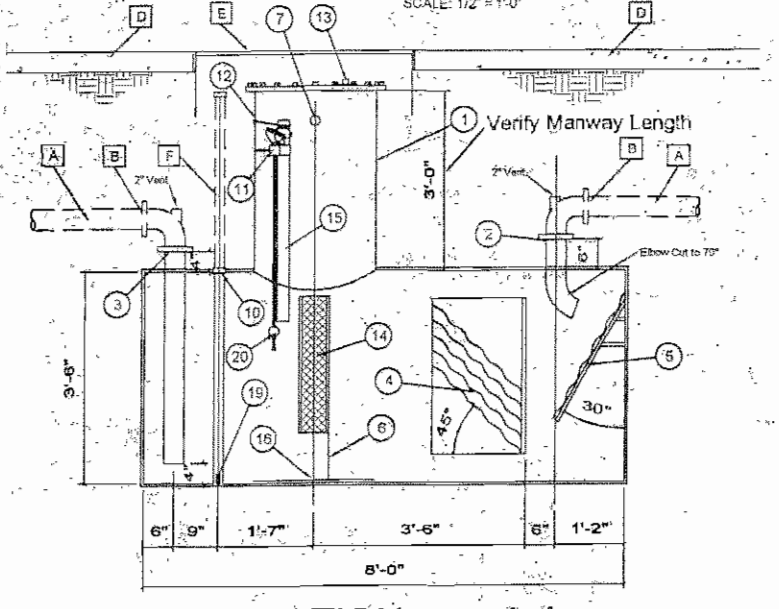
NOTES

1. Vents must be terminated per local codes and for safety requirements.
2. Separator must be filled with clean water prior to being put into service.
3. This separator is designed to remove free oils. Emulsions and/or dissolved hydrocarbons will not be removed by this equipment.





SECTION B-B
SCALE: 1/2" = 1'-0"



SECTION A-A
SCALE: 1/2" = 1'-0"

PSI Furnished Equipment

1. 24" I.D. Access Manway
2. 4" 150 lb. Flat Faced Flanged Inlet
3. 4" 150 lb. Flat Faced Flanged Outlet
4. 10 Gauge Corrugated Parallel Plate Separator
5. 10 Gauge Corrugated Plate Separator
6. 10" High Sludge Baffle
7. 2" NPT Half-Coupling Vent Connection
8. 7 Gauge Steel Closure Plates
9. Lifting Lugs (Not Shown)
10. 2" Schedule 40 Interstitial Monitoring Pipe
11. 2" Half-Coupling for Sensor Installation
12. 1/2" Full Coupling for Sensor Conduit Connection
13. 3" NPT Half-Coupling with Plug for Gauging
14. Polypropylene Coalescer in Stainless Steel Frame
15. 2" Internal Oil Suction Pipe with Camlock Connection
16. Steel Striker Plate
17. Stainless Steel Identification Plate
18. NEMA 4x Control Panel ATA-2
19. PSI Model PSLP-1 Leak Detection Probe
20. Stainless Steel Single Level Sensor
21. NEMA 7 Junction Box

Contractor Furnished Equipment

- A. 4" Piping with 150 LB. Flanged Connections
- B. 4" Flanged S.R. Elbow (OR TEE) with 2" Vent Connection
- C. 2" Diameter Vent Piping
- D. Concrete Pad At Grade (If Required)
- E. 42" Minimum Traffic Rated Manway Enclosure Cover
- F. 2" Threaded Leak Riser Pipe
- G. Flexible Conduit from Junction Box to 1/2" Coupling
- H. Conduit and 18 Gauge Sensor Wires to Control Panel

If drawing meets with your approval sign and date below and return to PS International so we may commence fabrication

Signature: _____

Date: _____

NUMBER	DATE	REVISIONS:	BY

PSI Quote No. 0870-0801

PSI Sales Order No. 0205-0481

Customer PO No. 10-4089

Project: NATIONAL GUARD FACILITY (OMS #6)
CAMP NAVAJO
BELLEMONT, ARIZONA

Sold To: SCS ENGINEERS
2702 N. 4th St. Ste. 105B
PHOENIX, ARIZONA 85006

PS International, Inc.
1013 Shenandoah Circle
Sioux Falls, S.D. 57103
Ph.#: (605) 332-1885
Fax#: (605 332-1293

Drawn:	Date:	Checked By:	Drawing No.
SDB	5-12-02	BJS	PSC-550-DW-J-08

SOLD TO

SCS Engineers
2702 N. 4th Street, Suite 105B
Phoenix, AZ 85008

PROJECT

National Guard Facility (OMS#6)
Camp Navajo
Bellmont, Arizona

PSI SEPARATOR MODEL

PSC-550-DW-J with exterior GLASTEEL® corrosion protection system. Accessories include a high oil alarm and leak detection system

SALES ORDER NO. 0205-0481

PS International, Incorporated

1013 Shenandoah Circle
Sioux Falls, SD 57103
Phone: 605-332-1885
Fax: 605-332-1293

Table of Contents

I. WARNINGS

A. Oil-water separators are flow through process vessels designed to remove free oils and grease. Separated product is hazardous and flammable! Extreme care must be used when servicing.

B. Personnel servicing equipment must follow proper safety requirements including but not limited to the use of protective clothing, approved breathing equipment, exterior safety personnel and other safety measures as may be required to meet confined space entry permits.

C. The separator must be properly vented by purchaser in accordance with governing safety codes for exit of combustible gases with respect to the environment. This may include the use of flame arresters in some areas. Check with local plumbing codes, NFPA 30 and/or other governing requirements.

D. Electrical Accessories

1. The separator must be grounded by purchaser as may be required by governing electrical codes.

2. Purchaser must ensure that the final state of all wiring is in accordance with the U.S. NEC and local codes for the service intended.

3. Electrical connections, electric motors and wiring must be appropriately protected from submergence and water infiltration. Intrinsically safe sensors and explosion proof pump motors must use wiring, conduit and connections necessary to maintain intrinsic safety. Conduit must be grounded at the control panel.

II. INSTALLATION

A. General

1. Quality control measures are taken in the factory to ensure the oil-water separator is free from defects at the time of shipment. These procedures include a factory air test of the primary vessel at 5 psi in accordance with UL-58, a holiday test of the exterior GLASTEEL fiberglass coating ensuring the vessel is pinhole free.
2. The fiberglass jacketed oil-water separator is shipped with a vacuum from the factory. When the separator arrives, read the vacuum gauge. If the reading is 7" of Hg or higher, the separator is sound. Sometimes the vacuum can be reduced with changes in elevation and temperature fluctuations even though it is free of leaks. Contact PSI if the reading is less than 7" of mercury.
3. Inspect separator when it arrives for general appearance and verify that all components are present. If damage is present or components are missing, provide a written description, have the trucker sign the document, and contact PS International at 605-332-1885. Some minor damage to the exterior fiberglass coating is acceptable and can be touched up with the fiberglass kits.
4. GLASTEEL installation kits are included with the separator shipment. The kits contain installation procedures with the box.

B. Preparation

1. The bottom and sides of the excavation shall extend a distance of at least one foot around the perimeter of the separator or as required by local conditions. The excavation and backfill shall be free from materials that may cause damage to the vessel or exterior coating.
2. If a concrete ballast pad is required, anchor bolts and straps must be placed as to not damage the exterior of the vessel. The separator should be separated from the concrete pad by at least 6" of sand or pea gravel, or by placing an approved heavy duty fabric (contact PSI for fabric requirements) between the separator and concrete pad.

C. Placing Separator

1. Equipment to lift the separator shall be of adequate size to lift and lower the separator into place without dragging the separator.
2. Cables or chains of adequate strength attached to the lifting lugs (not less than 45° included angle) shall be used to lift the separator. A spreader bar should be used if necessary. Chains or slings MUST NOT be used around the separator shell. Separator must be placed level and plumb for proper operation.
3. If required, install hold down straps and backfill around separator using clean non-corrosive inert material. The bottom sides of the separator shall be backfilled by shoveling and tamping to ensure that the bottom quadrant of the separator is evenly supported.
4. Backfill around separator using clean non-corrosive inert material. The bottom sides of the separator shall be backfilled by shoveling and tamping to ensure that the bottom quadrant of the separator is evenly supported.
5. Separator shall be filled to within 1 foot of the top of the vessel with clean water as soon as separator is in place and properly supported.

D. Piping Connections

1. Metal or plastic thread or flange protectors should be removed and the appropriate fittings installed using proper joint compound or gaskets. If steel pipe plug(s) are provided for fittings not currently being used, remove plug(s) and reinstall using proper joint compound.
2. Inlet and outlet piping should be sloped 1/4" to 1/16" per foot for a proper gravity flow system.
3. Vent piping must be installed in accordance with governing codes. The manway must be vented to prevent the build-up of hazardous gasses, the inlet should be vented to prevent air lock flow reduction, and the outlet must be vented separately to prevent siphoning and to keep vented gas out of the effluent piping. Refer to section I. WARNING for additional information.

4. Once piping connections are properly installed in the oil-water separator, seal exterior connections in accordance with GLASTEEL installation instructions. If separator is equipped with a bolt-on manway extension, coat bolts with remaining fiberglass from installation kits. Seal outside of manway bolt-on flange with fiberglass resin to cover the edge of the flange. DO NOT seal the top cover of the separator with fiberglass.

E. Electrical Accessories

1. PSI has supplied a single level stainless steel sensor, and a Warrick Model DLP-1 leak detection probe and cap assembly, and a NEMA 4x alarm control panel ATA-2 with the oil-water separator.

2. Use an Ohm meter and move the sensor float up and down to verify sensor was not damaged shipment. Install the level sensor in the 2" coupling located inside the round access manway (Item 11 on drawing). Install a 2" riser pipe to grade for access to interstitial space (Item F on drawing). Next, install the leak probe inside the 2" leak monitoring pipe. Suspend the leak probe 2" to 6" above the bottom of the vessel. Run conduit and 18 gauge wire between the control panel and sensors. The conduit must be protected from water infiltration, which may cause an electrical short in the system. Connect the High Oil level sensor wiring (Red Wires) to terminals 1 and 2 on the ISR intrinsically safe relay mounted in the control panel. Connect the leak sensor wiring to terminals 3 and 4 on the ISR intrinsically safe relay mounted in the control panel. The sensors remain intrinsically safe when the wiring and conduit are installed with proper explosion proof seals.

3. Mount control panel in the location intended for service in a non-hazardous area. The control panel requires 120 volt, single phase power. Refer to the sensor and panel wiring diagrams in Section V. APPENDIX.

III. OPERATION

A. General

1. The PS International oil-water separator is designed to remove free oils and grease. The separator flow rate is listed on the separator drawing in Section V. APPENDIX. PSC model oil-water separators are designed to produce an effluent quality of 10 ppm or less free oil.

2. The separator always operates full of liquid. The separator must initially be filled with clean water during installation and refilled with clean water after oil or solids are removed. The separator level is established by the invert elevation of the outlet pipe. As oily waste enters the separator, a corresponding amount of separated effluent is discharged from the separator.

3. The following is a description of the flow path through the oil-water separator:

   a. The influent enters the separator via the inlet pipe. The invert of the inlet piping is higher than the static operating surface of the vessel to provide positive drainage of the pipe.

   b. Flow is directed off a single corrugated plate separator set at an angle perpendicular to the flow stream. This method of separation is known as the Buffalo-Morse Principle. The inlet plate reduces the fluid velocity head of the incoming stream and spreads the flow out over the cross sectional area of the separator. The plate corrugations create sinusoidal flow patterns, which causes solids to break out of the flow stream and oil droplets to collide and coalesce.

   c. The second stage of separation is based upon the proven Royal Dutch Shell Principle of using multiple corrugated parallel plates. The parallel plate pack consists of heavy gauge removable corrugated steel plates. The plates are inclined at a 45° angle to prevent the accumulation of solids. An open area is located directly below the plate pack to allow solids to pass downstream and collect behind the sludge baffle.

d. The sludge baffle in the separator is located directly below the access manway. This provides easy access for removing sludge from grade with the use of a sludge pump or vac truck. The sludge baffle aids in separation by directing flow from the bottom quadrant of the vessel towards the top of the vessel aiding in the floatation of oil droplets.

e. Model PSC oil-water separators include the use of the PSI polypropylene polishing coalescer. This special matrix of polypropylene fibers of varying sizes is designed to remove oil droplets down to 20 microns in size. Dedicated tracks are provided to enable the coalescer to be removed and reinstalled easily from grade. The coalescer only requires periodic cleaning to remove solids and debris and has an estimated life of over 10 years under normal operating conditions.

f. Separated effluent is discharged from the vessel through the outlet pipe that is located in the most quiescent section of the vessel. The effluent will contain a free oil effluent quality of no more than 10 ppm.

B. Oil Accumulation

1. The oil-water separator is filled with clean water when it is installed and put into operation. As oily wastewater enters the separator, a corresponding amount of separated effluent is discharged from the separator. Oil droplets that are coalesced in the separator rise to the liquid level surface in the vessel.

2. The level sensor float will float in water and sink in oil. As oil accumulates, it builds a layer downward in the vessel. When the oil load reaches and immerses the level sensor float, the float will drop and illuminate the High Oil Alarm pilot light and sound alarm bell. The bell may be silenced with the silence push button. The High Oil level sensor and control panel are designed to provide an oil level alarm when ~140 gallons of oil accumulate in the separator. The oil layer may be removed at this time or any time prior to this loading. See Section IV. MAINTENANCE for information on removing oil.

C. Solids Accumulation

1. Most oil-water separators handle run-off from an area where sand, dirt, gravel, grass clippings, debris, etc. can enter the piping system. Since the flow velocity is reduced in an oil-water separator, the debris will collect in the vessel. The amount of accumulation is site specific and will depend upon the quantity of solids in the run-off. IT SHOULD BE NOTED that this vessel is designed for oil-water separation and is not specifically designed for solids removal. If a high solid loading is expected in the influent, an inlet solids compartment or solids catch basin upstream of the vessel should be utilized.

2. The PSI oil-water separator uses a special arrangement of inclined corrugated plates to prevent the accumulation of solids. As the flow stream enters the separator and is directed off the inlet corrugated plate, most of the heavy solids settle to the bottom of the vessel. Suspended solids, if present, can enter the parallel plate pack and settle out of the flow stream. However, the plates are inclined at a 45° angle, which allows the solids to drop out of the plates.

3. An open area is located beneath the parallel plate pack to prevent the build-up of solids in front of the plates and allow solids to pass downstream of the pack. The internal hydraulics of the vessel move solids along the bottom of the vessel where they accumulate behind the sludge baffle. See Section IV. MAINTENANCE for information on removing sludge.

D. Electrical Accessories

1. For a description of how oil collects in the separator, re-read Paragraph B. Oil Accumulation in this Section III. OPERATION.

2. When the separator is full of water, the sensor float is up and the switch is open. When oil builds down and immerses the float, the float will drop and close the internal magnetic reed switch and activate the high oil alarm at the control panel. Oil must be removed from the separator when the High Oil alarm activates. The bell may be silenced with the pushbutton. When oil is

removed and the separator is filled with water, the float will raise and deactivate the alarm light.

3. The leak probe contains an internal float that is down in the dry interstitial space. If liquid begins to accumulate between the two walls, the float will rise and close its internal switch and activate the leak alarm at the control panel. The bell may be silenced with the silence pushbutton.

4. If a leak is ever detected, the separator integrity should be tested by pressure or vacuum testing vessel. Contact PSI for instructions.

5. Pressing the test push buttons at the bottom of the control panel may test the alarm lights and alarm bell function. This procedure only tests the function of the bell and the alarm pilot lights.

IV. MAINTENANCE

A. General

1. It is important to note that each installation is unique. The level and frequency of maintenance performed will vary from site to site. Always refill separator after oil or sludge is removed.

2. The PS International oil-water separator is designed for ease of maintenance. Oil and solids levels can be inspected from grade and removed from grade. The parallel plates typically require very little maintenance. Under high solids loading, it may be necessary to inspect the internals of the oil-water separator using proper safety gear and procedures. See section I. WARNINGS. The first inspection of the internals of the separator should be based upon the quantity of sludge that is removed from the separator; however, it should be inspected within the first three years of operation.

B. Oil Level Management

1. An oil level alarm is provided to indicate when ~140 gallons of oil have accumulated in the separator. The oil must be removed when the High Oil alarm activates or at any time prior to this oil loading. The oil level may also be checked manually by using a gauge stick and water detection paste. The water detection paste will change color when it comes into contact with water. Place the paste on one side of a gauge stick and lower it into the separator. Measure the distance from the top of the liquid level on the stick to the level where the paste changed color. Refer to the Separator Capacity Chart in Section V. APPENDIX to correlate the thickness of the oil layer to the volume of oil in the vessel.

2. To remove oil from the separator after the oil alarm has activated, attach the suction hose from a self-priming pump or vac truck to the 2" oil suction pipe located inside the access manway. Pump until the oil layer drops to the bottom of the pipe. If oil is removed using the 2" oil suction pipe prior to the alarm activating, water may be temporarily transferred to storage until the oil level lowers and reaches the inlet of the suction pipe.

3. Oil may also be removed by lowering a suction hose from a pump directly into the oil layer. Off-load oil from the top down being careful not to lower the pipe into the water layer. Off-load oil until layer is satisfactorily reduced.

C. Sludge Level Management

1. The period between sludge level inspection and removal will be determined by experience. PSI recommends checking the separator after the first three months in operation. If solids loading is high, remove solids and check the level in another three months or less. If solids loading is low, check the separator after six months of operation and so on as experience dictates.

2. Solids accumulate in the oil-water separator behind the sludge baffle, which is located below the round access manway. Refer to the separator drawing in Section V. APPENDIX for location. The solids level can be checked with a long gauge stick by removing the round access manway cover and lowering the stick to the bottom of the vessel. You will be able to determine if the stick is striking accumulated solids or the bottom of the steel vessel. If solids are present, stir around to determine the approximate quantity of solids present.

3. If the solids layer is approximately 6" thick or higher, the accumulated solids should be removed from the vessel. If the sludge is hard packed, agitating the sludge with a stream of water may assist the removal.

Refill separator with water after oil and/or solids are removed.

D. Polypropylene Coalescer

1. The coalescer consists of polypropylene media in a stainless steel framework. Dedicated channels and a steel lifting handle are provided for removing and reinstalling the coalescer from grade. This secondary coalescer is self-unloading of oil and only needs to be periodically cleaned to remove accumulated solids. Inspect the coalescer after the first six months of operation and then as experience dictates.

2. Remove and inspect the coalescer for solids accumulation. Use a pressure washer or other means to clean solids from the coalescer. If necessary, the media may be removed from the steel framework to assist in cleaning. If possible with this installation, the media may be cleaned upstream of the separator, which allows the oily water to flow back into the vessel. After cleaning, reinstall the coalescer back into the separator by sliding it down the dedicated steel channels.

E. Electrical Accessories

1. Keep the control panel door properly closed when in operation. The level sensor float should be clear of debris and operate freely. Since the level sensor is mounted in the manway, the entire control system may be tested by lowering a long stick into the manway and using it to push the float down. Moving the float downward simulates oil accumulation and should activate the alarm light and alarm bell at the control panel. Push the test buttons on the control panel if you only wish to test the function of the alarm bell and alarm lights.

ATTACHMENT 5.

ARIZONA ARMY NATIONAL GUARD

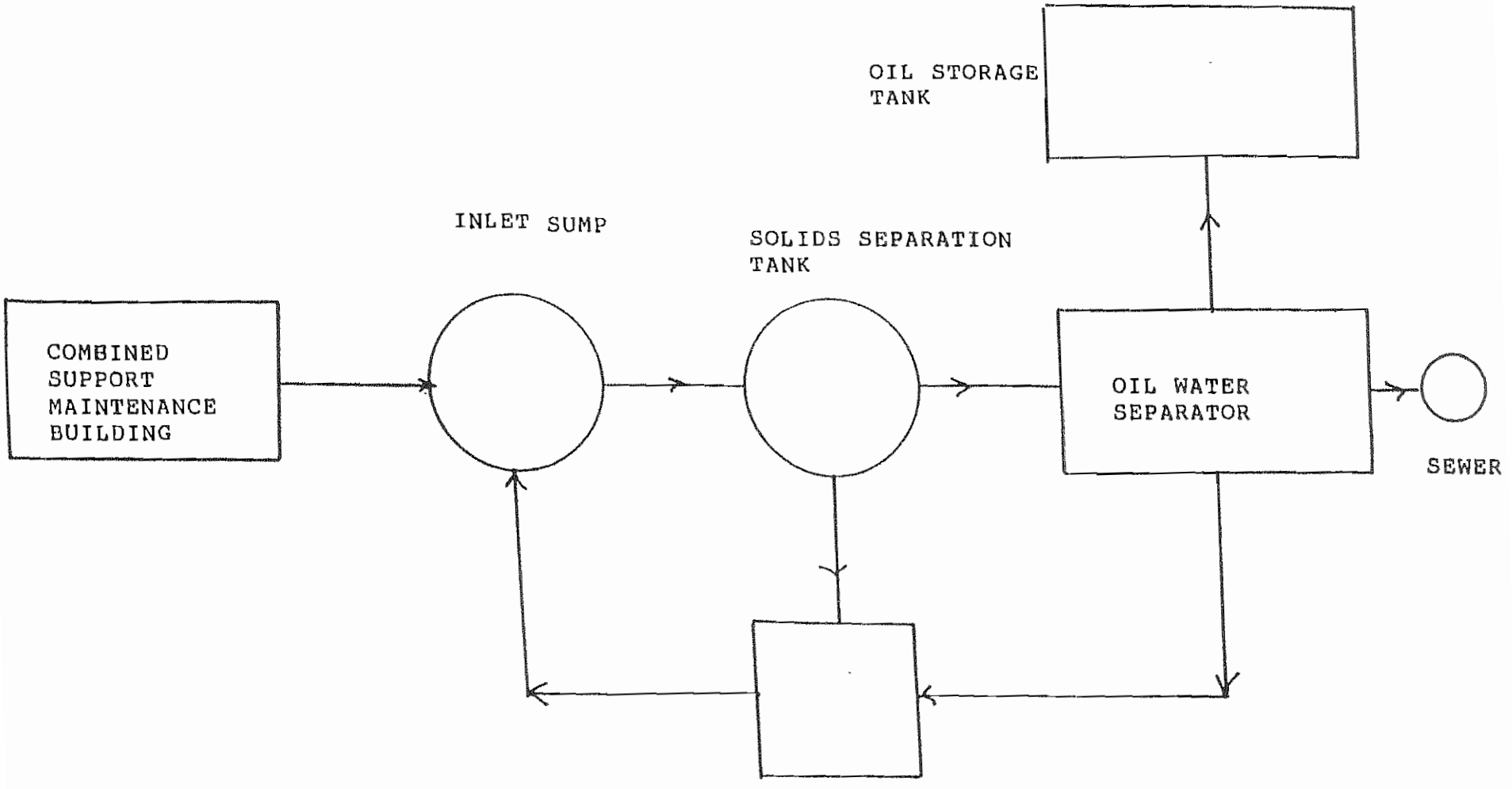
COMBINED SUPPORT MAINTENANCE SHOP

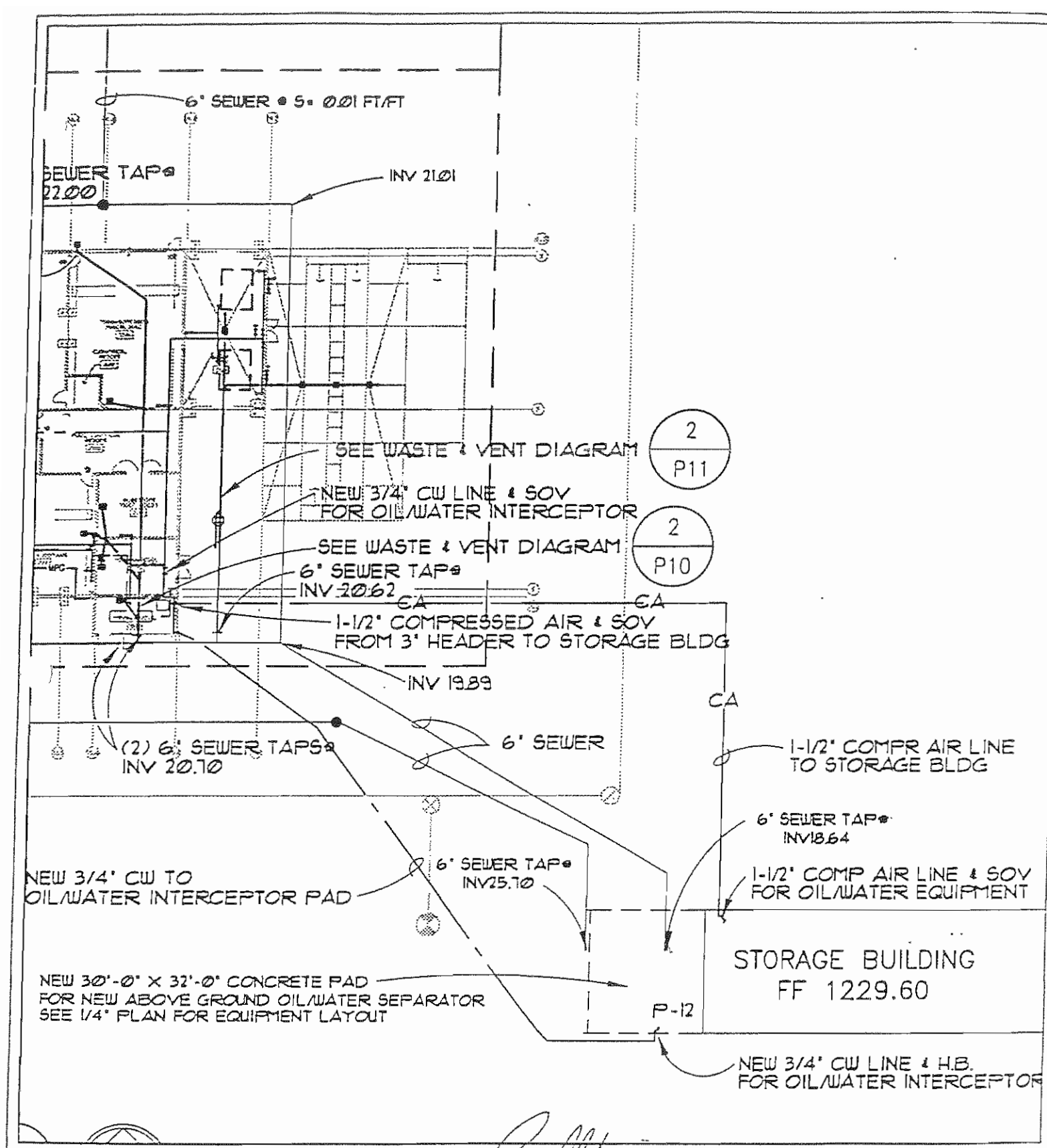
OPERATIONS AND MAINTENANCE MANUAL

By

Applied Process Equipment, Inc.
15207 N. 75th Street, Suite 101
Scottsdale, AZ 85260-2445

FLOW DIAGRAM





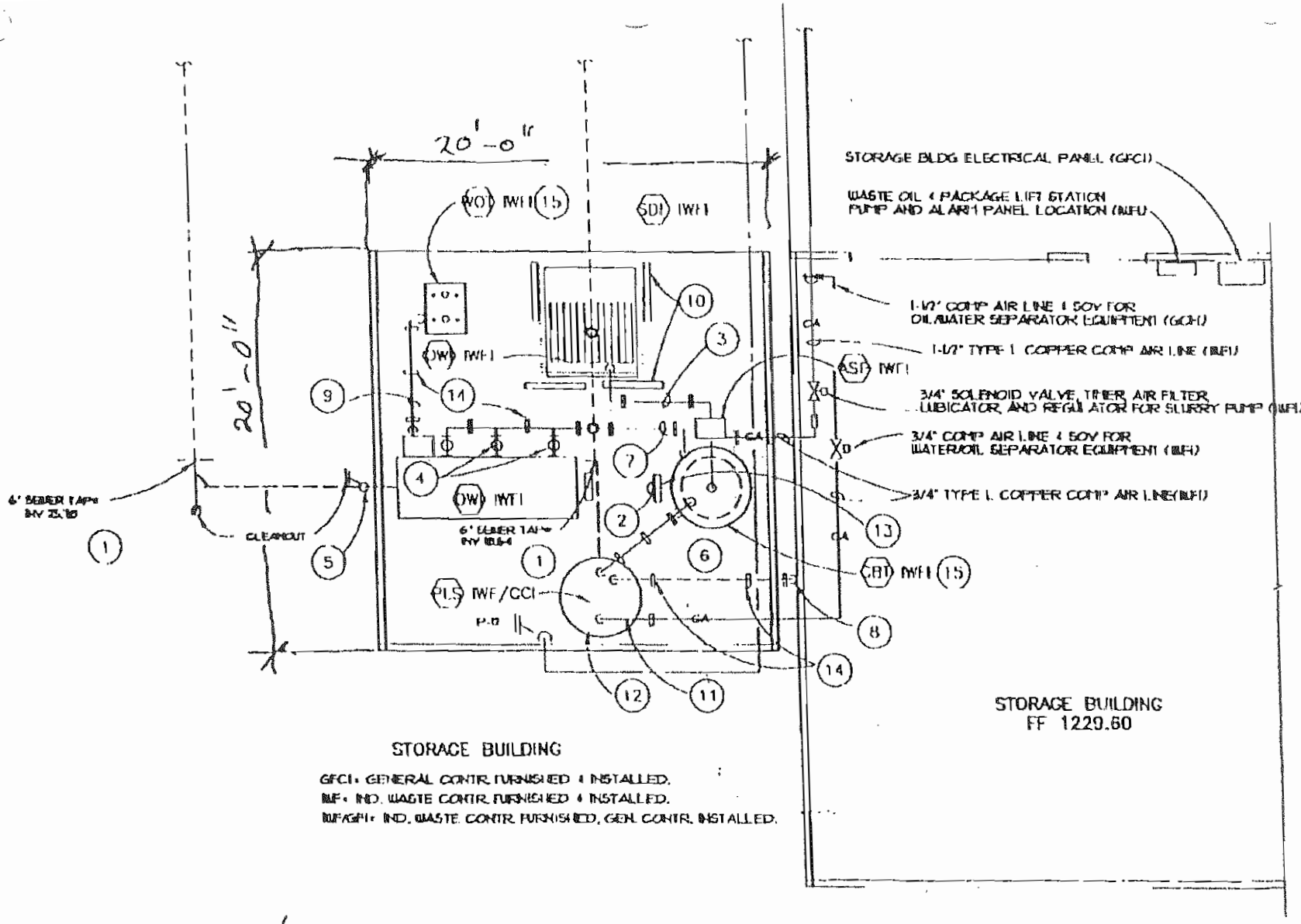
Schwimmer
520 East Southern Ave. #102
Tempe, Arizona 85282
HVAC, Plumbing & Fire Protection Consultants
Phone: (480)968-6440

Registered Professional Engineer (Mechanical)
CERTIFICATE NO.
8007
RAY A.
SCHWIMMER
Date Signed 11-15-99
ARIZONA, U.S.A.

JOB TITLE
Army National Guard
Combined Support Maint. Shops

SHEET TITLE
NEW OIL/WATER INTERCEPTOR UTILITIES

JOB NUMBER	DRAWN BY	SHEET NO
99001	RAS	SKP1.1
SCALE: NONE	DATE: 11/15/99	

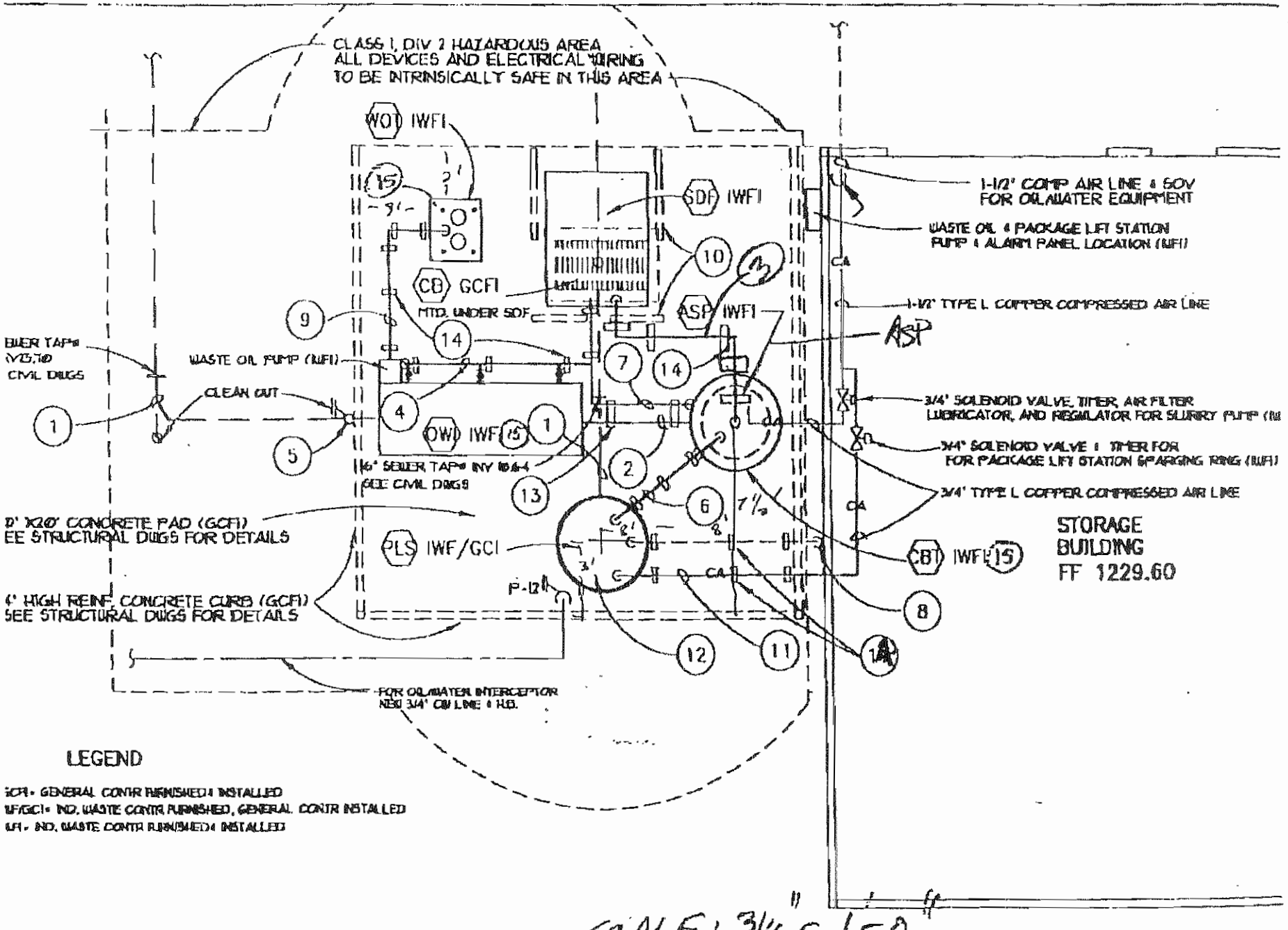


Not to Scale!

ENLARGED OIL/WATER SEPARATOR PAD PLAN (2)

SCALE: 3/16"=1'-0"

2/P11



SCALE: 3/16" = 1'-0"

OVERVIEW OF SYSTEM

1. System was designed for automatic operation with a minimal amount of maintenance.
2. System was designed to remove free hydrocarbons and suspended solids at the rate of 50 gallons per minute.
3. System was not designed to remove emulsified hydrocarbons.
4. System was not designed to remove B.O.D.
5. System to receive drainage from the Combined Support Maintenance Shop.

MAINTENANCE

DAILY

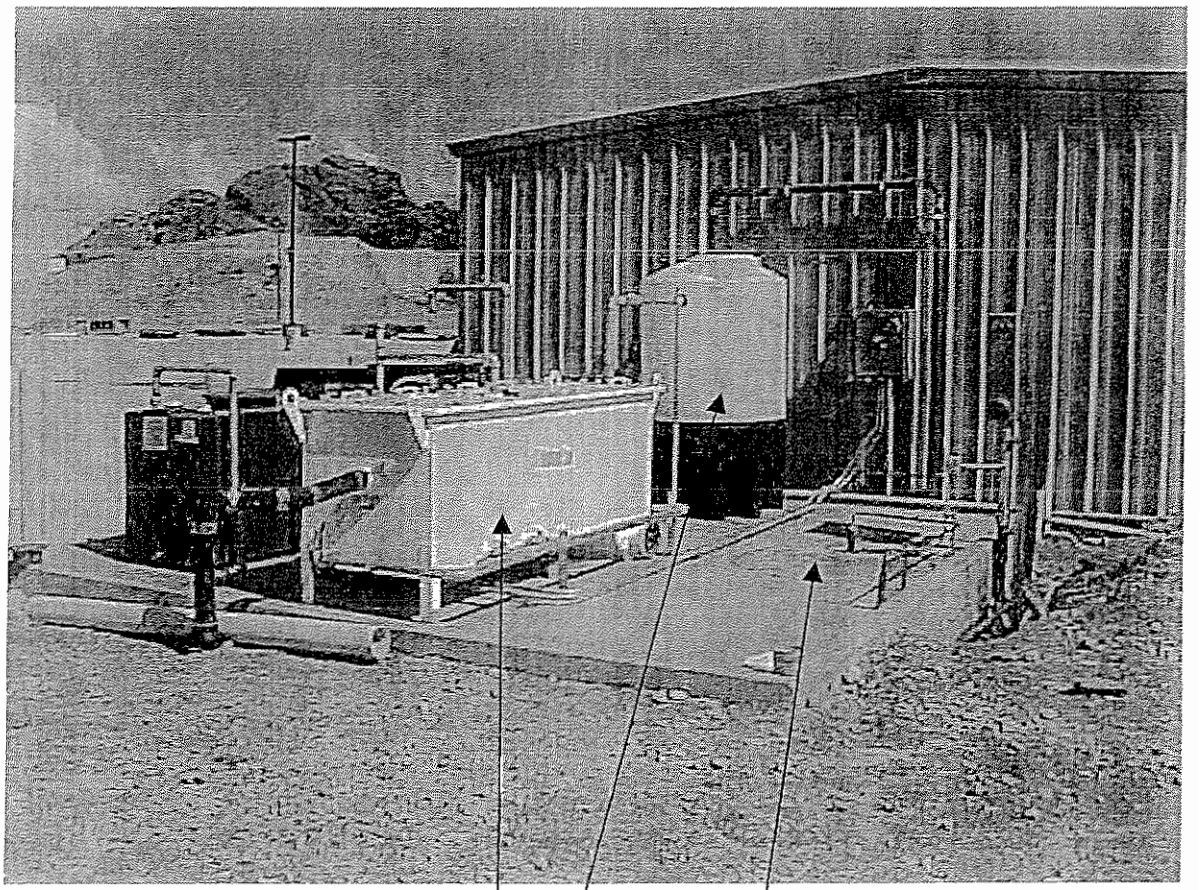
1. Open sparge ring valve
2. Open all bottom flush valves on oil water separator when pump starts.
3. Turn off all bottom flush valves when pump stops.
4. Close sparge ring valves
5. Observe system conditions for leaks or malfunctions.

MONTHLY

1. Empty collected solids from RGF solids removal container.
2. Check level of oil in oil storage tank, empty as needed.

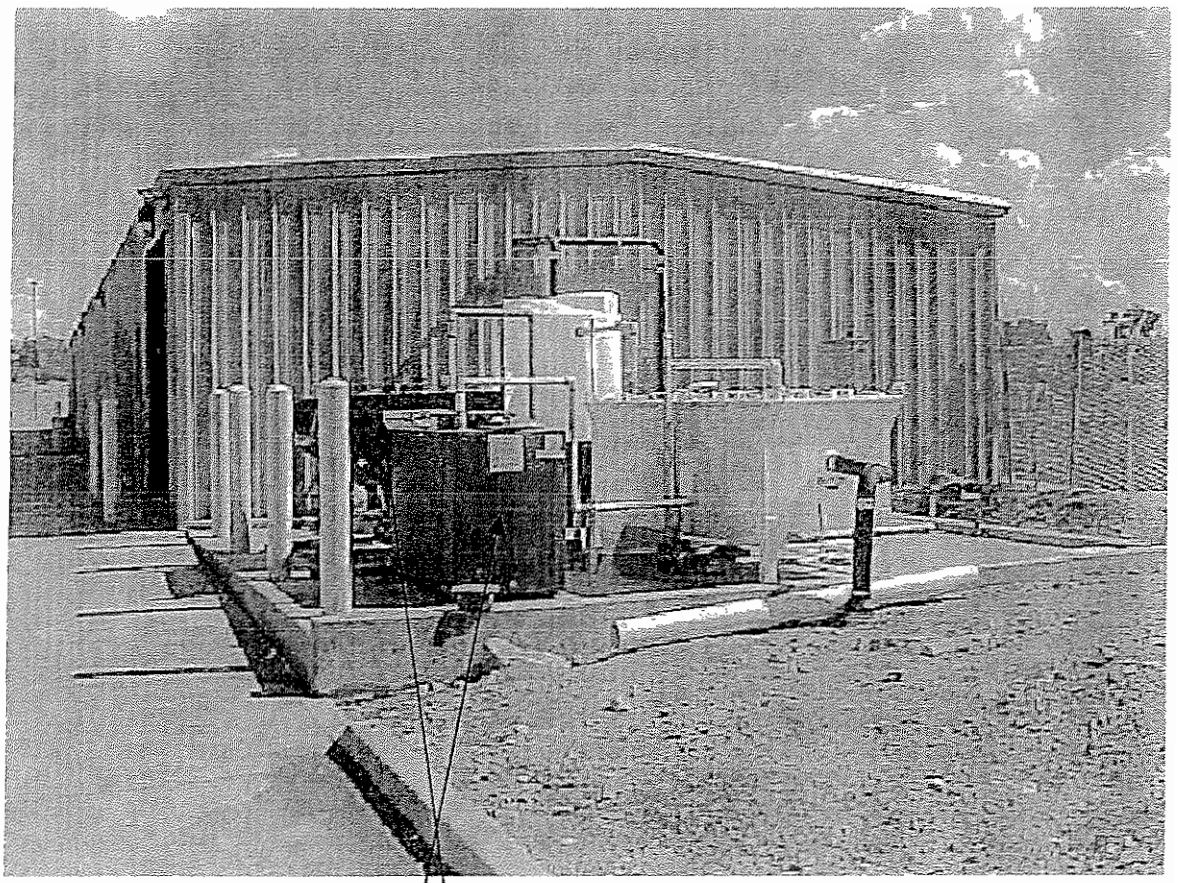
QUARTERLY

1. Shut off all system pumps
2. Close inlet flow control valve to oil water separator
3. Remove top off oil water separator.
4. Run oil transfer pump in manual mode to remove any oil in oil water separator.
5. Open all bottom flush valves on the oil water separator.
6. Flush oil water separator with water using a (garden hose only).



SIGHT OVERVIEW #1

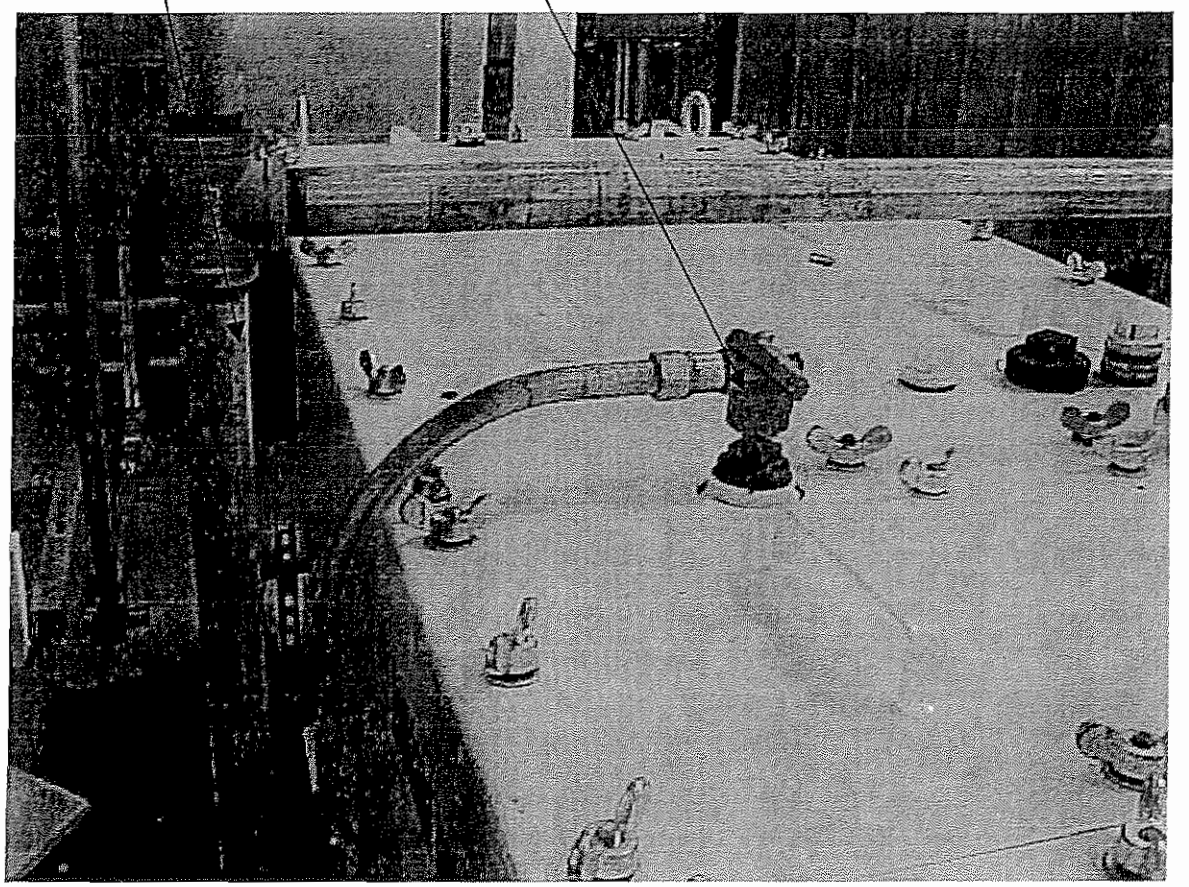
1. INLET SUMP, PUMPS AND SPARGE RING
2. SOLIDS SEPARATION TANK
3. OIL WATER SEPARATOR

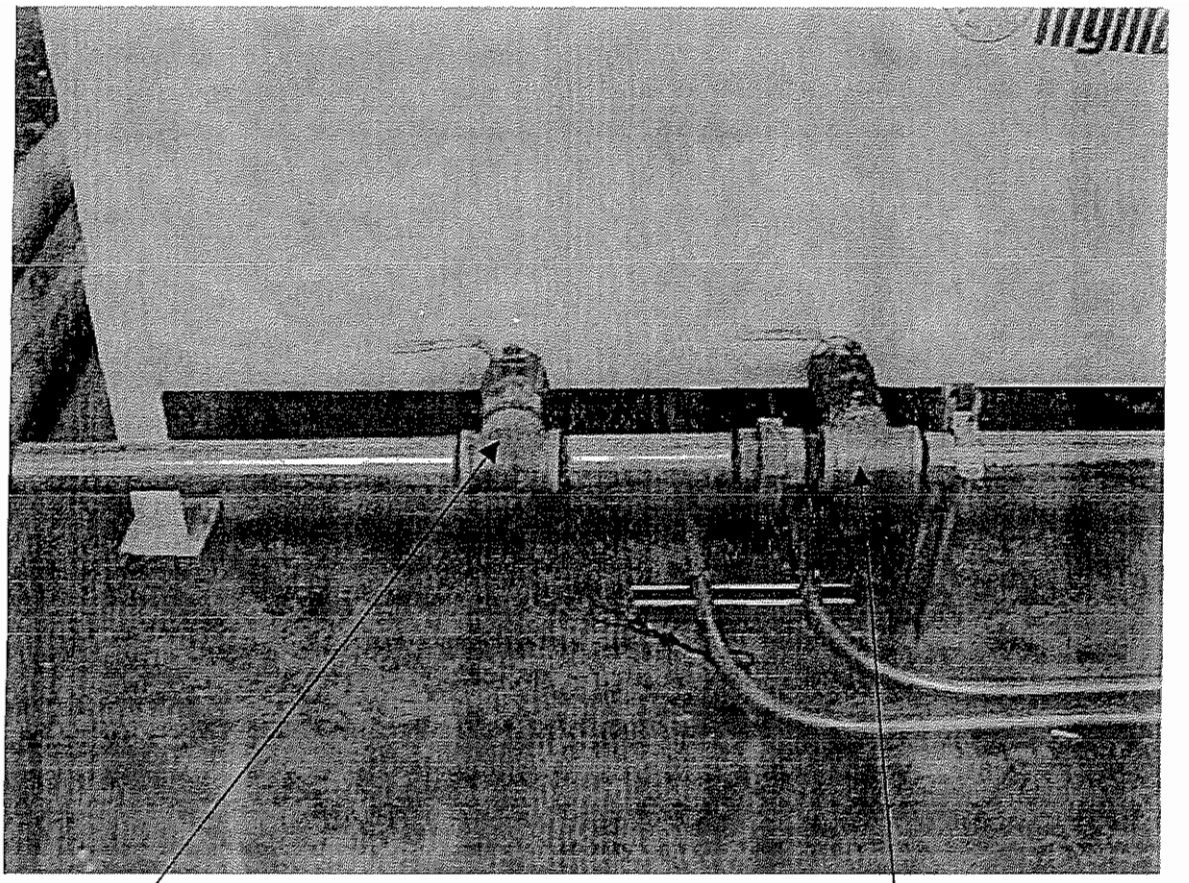


SIGHT OVERVIEW #2

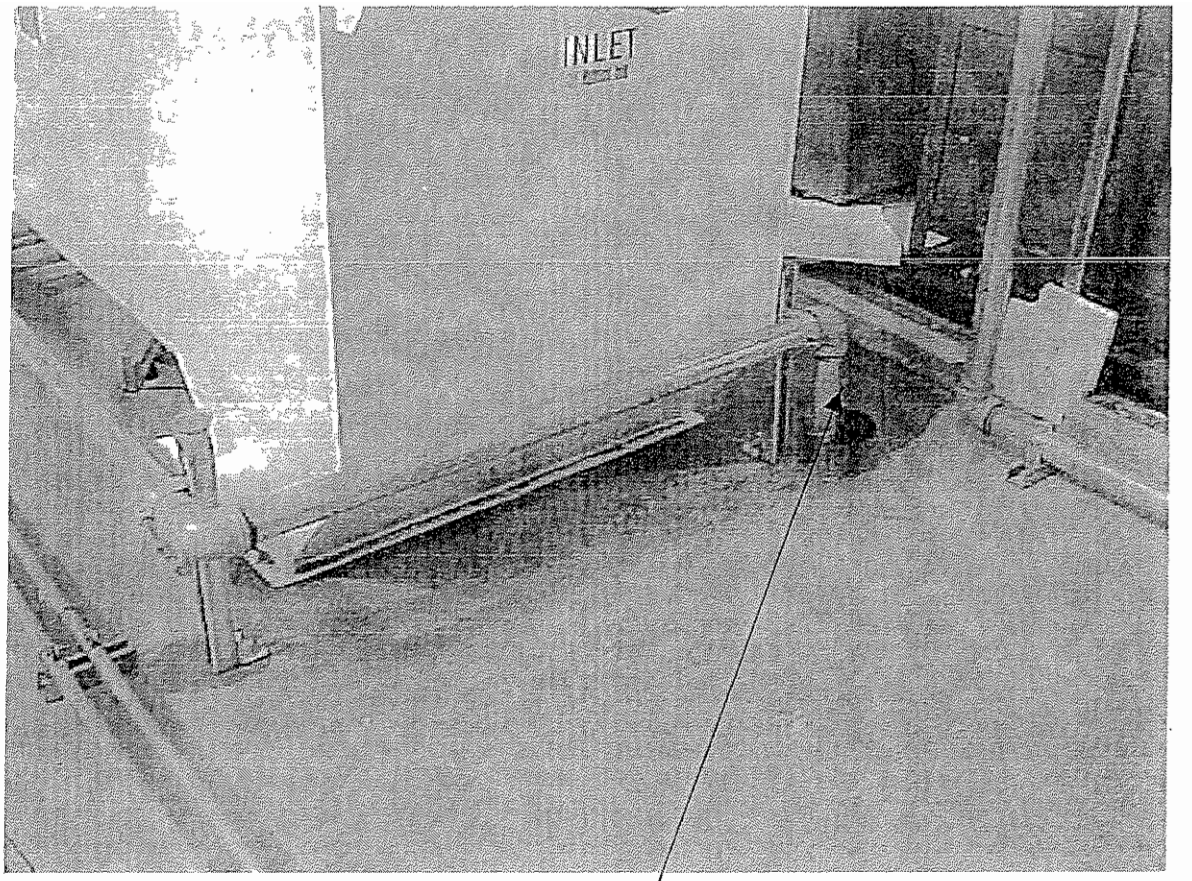
1. OIL STORAGE TANK
2. SOLIDS REMOVAL UNIT

1. OIL PUMP OUT LINE
2. OIL LEVEL SENSOR

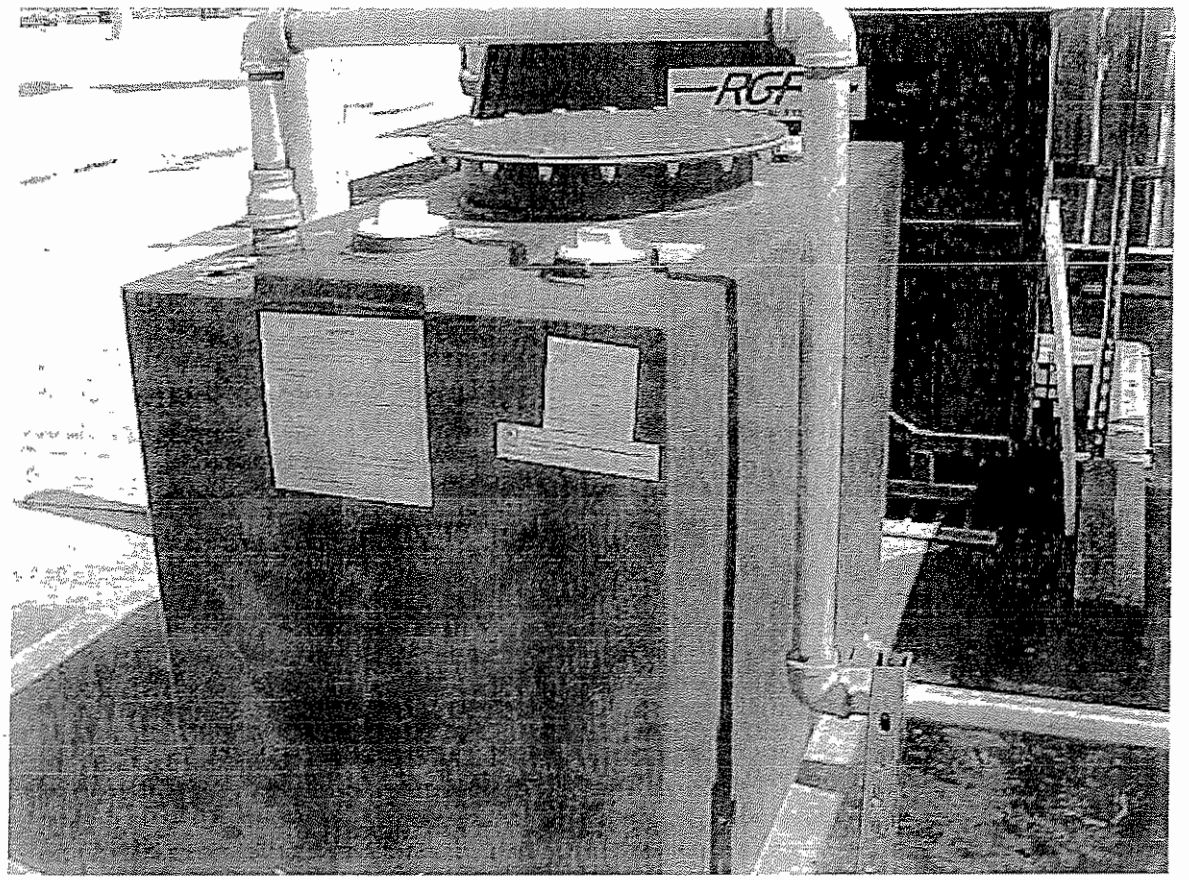




1. OIL WATER SEPARATOR BOTTOM FLUSH VALVES

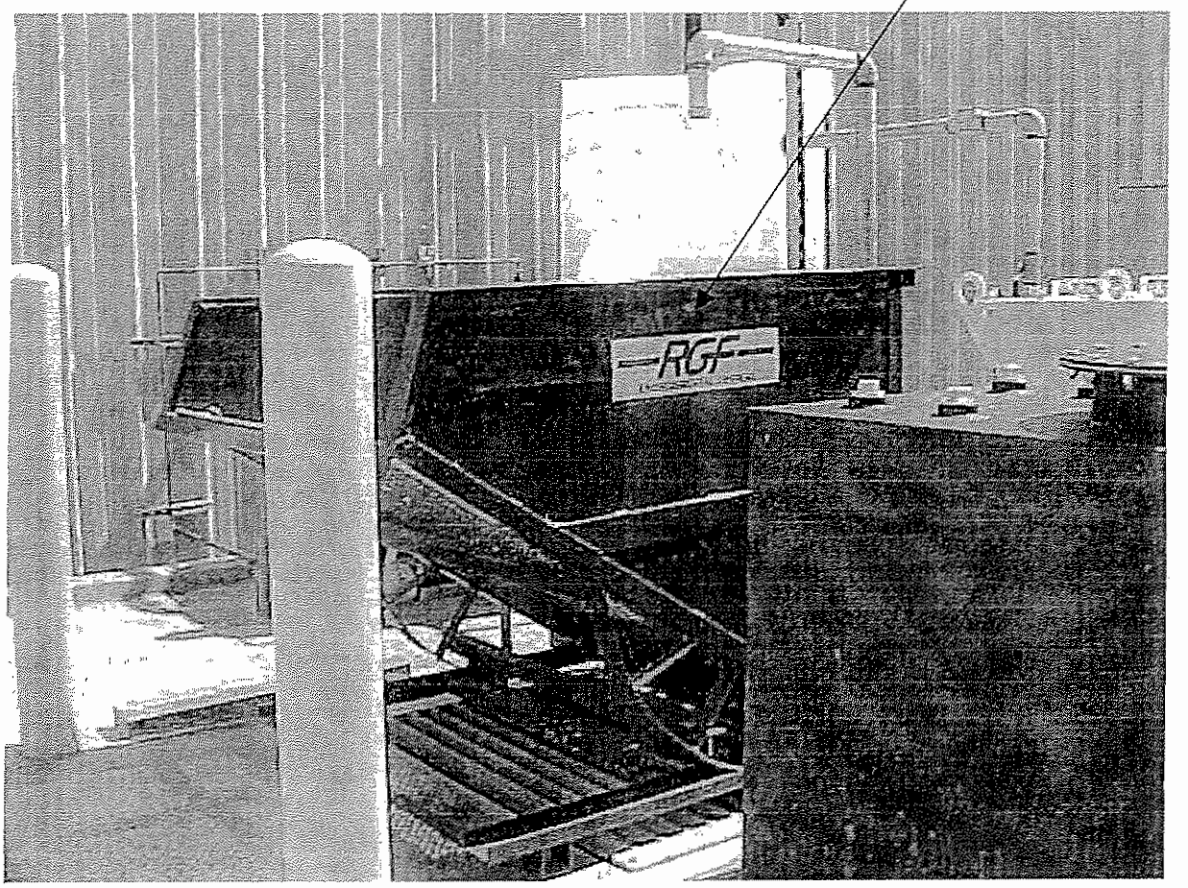


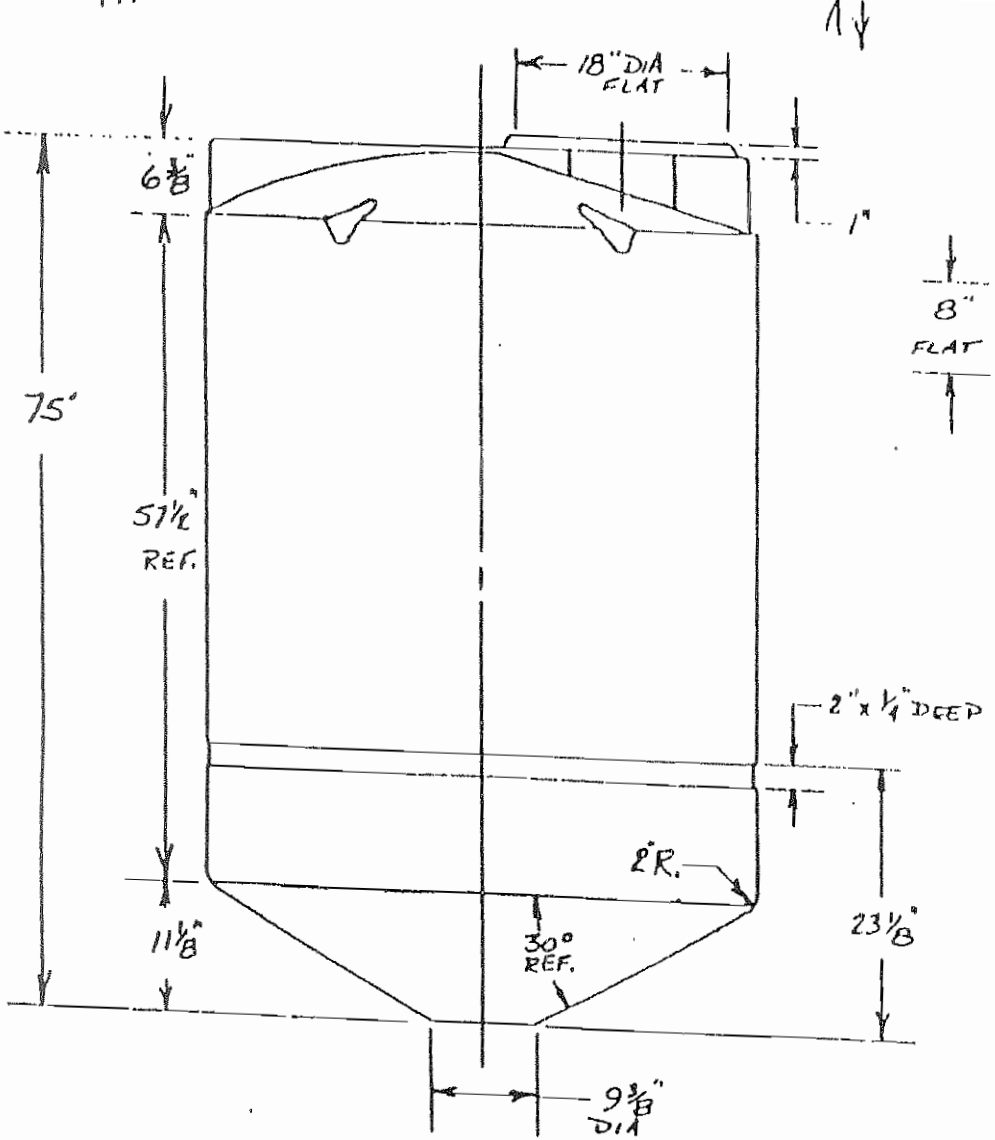
1. BOTTOM FLUSH LINE TO DRAIN

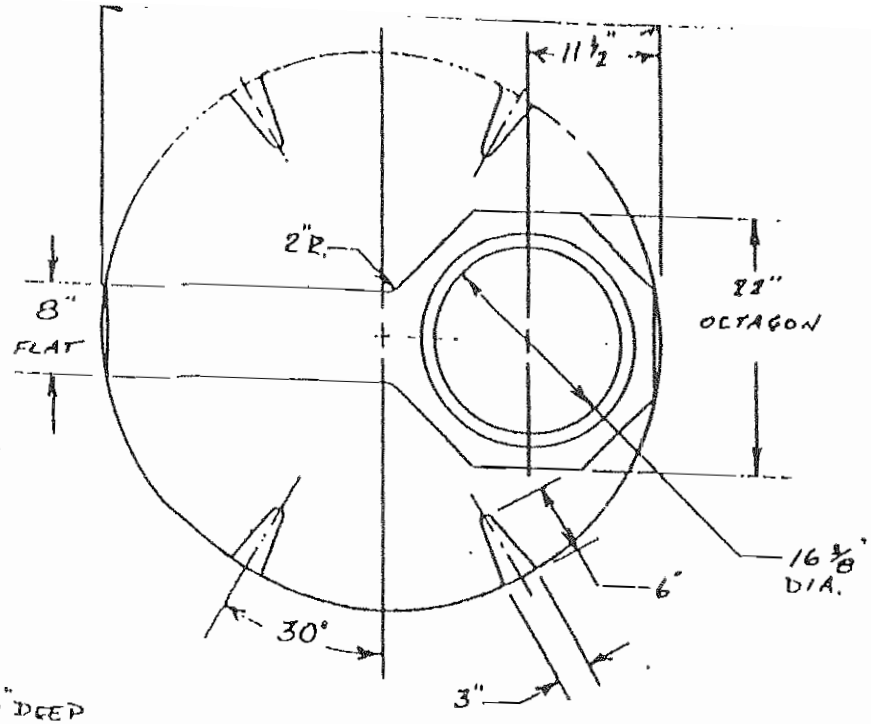


OIL STORAGE TANK

SOLIDS REMOVAL CONTAINER







VIEW A-A

Rev.	Date		
CHEM-TAINER INDUSTRIES, INC. 361 Neptune Ave N. Babylon, NY 11704 (516) 661-8300 Fax (516) 661-8209		Date 5/6/93	Scale
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		Drawn By:	Cust Rep
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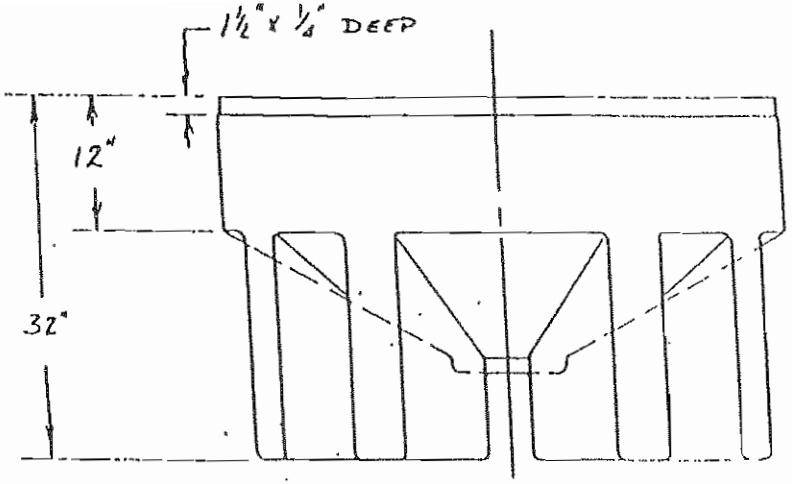
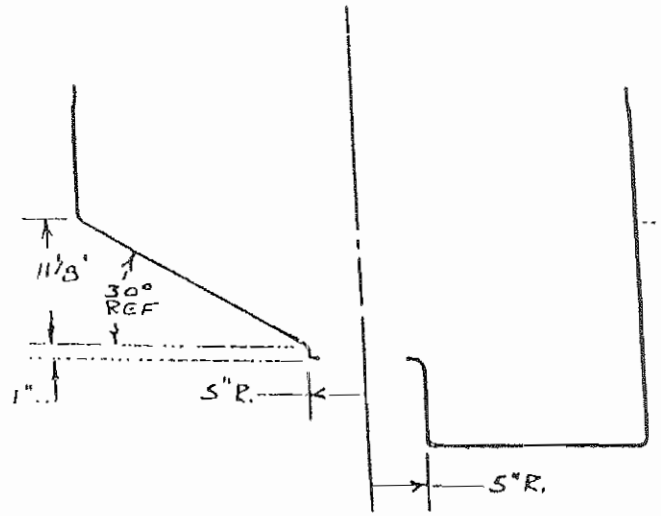
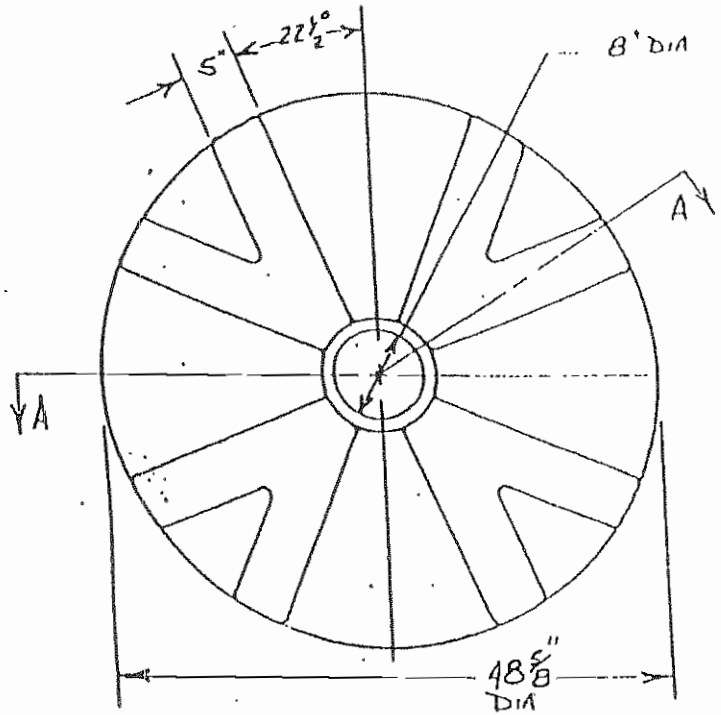
Dwg # TC 4-885 JA. NP		A-1165	





SECTION A-A



Rev.	Date		
CHEM-TAINER INDUSTRIES, INC. 361 Neptune Ave N. Babylon, NY 11704 (516) 661-8300 Fax: (516) 661-8209		Date 5/6/93	Scale
		Material	Sheet
		Drawn By:	Cust Rep
TITLE: STAND, 500 GAL. CONE BOTTOM TANK			
Dwg # TC 4885 JT. NP		A-1255	

GENERAL SPECIFICATIONS

NO. REQ'D: (1)
CAPACITY: 600 GALLONS
SPILL CAPACITY: 200 GALLONS
E: RECTANGULAR, HTC, ABOVEGROUND, SINGLE WALL, SLUDGE HOPPER

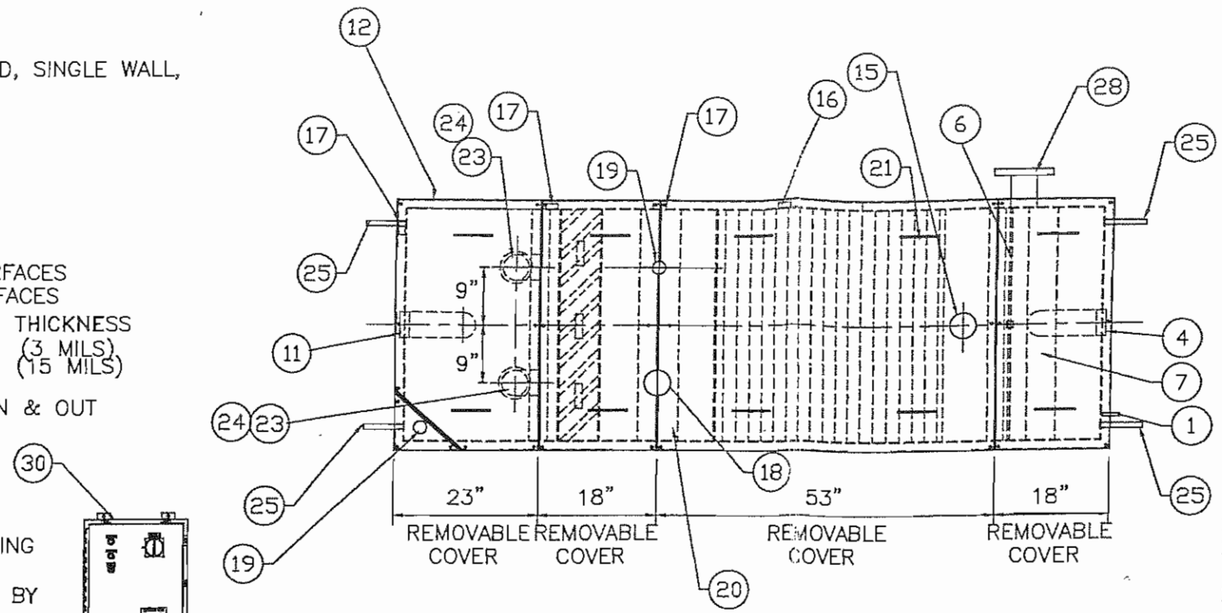
MATERIAL: MILD CARBON STEEL
APPROX. WEIGHT: 1850 LBS.
FLOW RATE: 50 GPM
GAUGE:
7 GA THROUGHOUT

SURFACE PREP:
SSPC NO.10 BLAST ALL INTERIOR SURFACES
SSPC NO.6 BLAST ALL EXTERIOR SURFACES

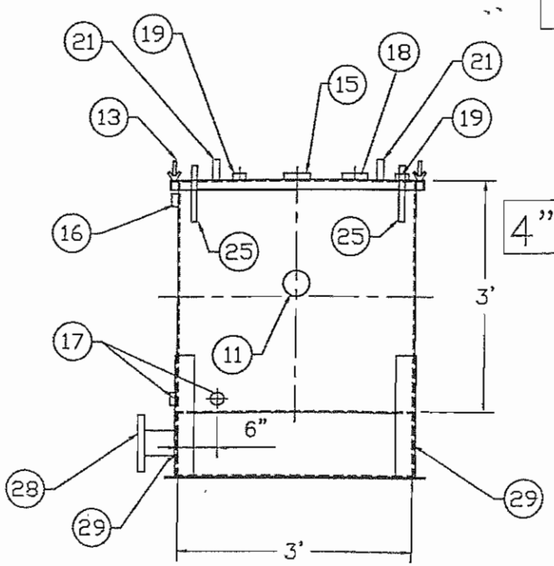
COATING:	MATERIAL	THICKNESS
EXTERIOR–	EPOXY/URETHANE WHITE	(3 MILS)
INTERIOR–	CORROCOTE PW	(15 MILS)

CONSTRUCTION:
BUTT FIT AND WELD ALL CORNERS IN & OUT

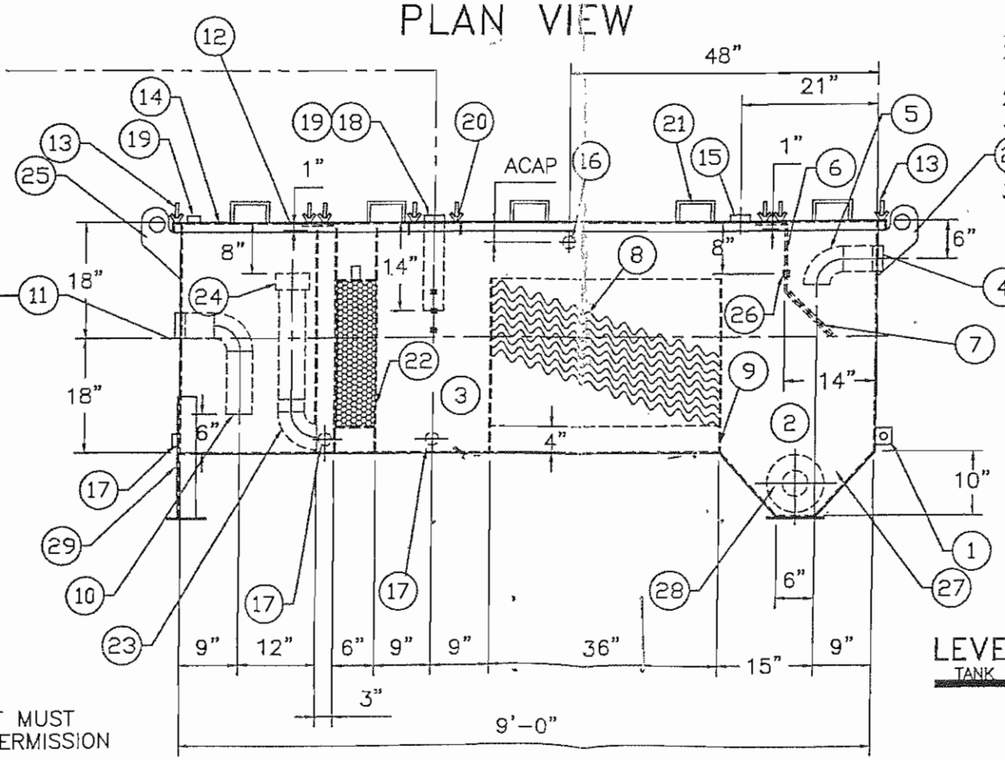
NOTE:
1. ALL INTERNAL MATERIAL IS 10 GA.
2. ALL FITTINGS MUST SHIP W/ STEEL PLUGS INSTALLED
3. LIFTING LUGS DO NOT HAVE REINFORCING PLATES
4. **ON SITE AIR TEST I IS TO BE DONE BY INSTALLING CONTRACTOR.**



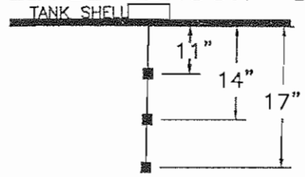
PLAN VIEW



END VIEW



ELEVATION



LEVEL SENSOR "B"

2C–17E–14E–11A

PROVIDED EQUIPMENT

1. 3"X3"X1/4" FLAT W/ 1/2"ø HOLE DRILLED IN CENTER (GROUNDING LUG)
2. SEDIMENT CHAMBER
3. OIL WATER SEPARATOR CHAMBER
4. THREADED INLET
5. PVC INLET ELBOW PIPING
6. VELOCITY HEAD DIFFUSION BAFFLE 10GA
7. WEAR PLATE (1/4" MATERIAL)
8. REMOVABLE PARALLEL CORRUGATED PLATE COALESCER (GALVANIZED)
9. SLUDGE BAFFLE – 10GA
10. PVC OUTLET DOWNCOMER
11. THREADED OUTLET
12. REMOVABLE COVERS 4–REQUIRED (7 GA.)
13. NUTS & BOLTS W/ LARGE WING (CORROSION RESISTANT)
14. GASKET MATERIAL (FOR EACH REMOVABLE COVER)
15. 3"ø NPT (CLEAN–OUT)
16. 2"ø NPT (VENT)
17. 2"ø NPT (DRAIN)
18. 3"ø FULL COUPLING W/ 3" INTERNAL PVC PIPE
19. 2"ø NPT (FOR OIL LEVEL SENSOR)
20. 7GA. CROSSMEMBER 9" WIDE FOR OIL PUMP–OUT & LEVEL SENSOR FTG.
21. 3/4"ø ROUND STOCK TYP. ALL HANDLES
22. 6" THICK COALESCER MATERIAL
23. 4"ø STEEL ELBOW W/ HALF COUPLING WELDED TO TOP FOR PVC RISER PIPES
24. 4"ø ADJUSTABLE FERNCO COUPLING
25. LIFTING LUGS
26. 1"ø COUPLING W/ PLUG
27. SLUDGE HOPPER WITH BASE PLATE
28. 4"ø 150 # R.F.S.O. FLANGE FOR SLUDGE HOPPER CLEAN OUT DRAIN
29. 3" x 3" x 1/4" ANGLE LEGS W/ BASE PLATES
30. SPECIAL "B" PANEL – 3 FLOAT OIL PUMP–OUT W/ AUX. HIGH–LEVEL WASTE OIL TANK ALARM
31. LEVEL SENSOR "B"
32. "PRICE" OIL PUMP–OUT PUMP – MODEL SP4.75/.44 (10 GPM @ 20" TDH) 1/2"HP, 1/120 VOLT, TEFC, 1750 RPM (NOT SHOWN)

Fabrication Will NOT Begin Until Highland Tank Receives Approved Drawing
Drawing Approved by:

Date: _____
General Notes Reviewed by:

REVISIONS

Highland Tank

600 GALLON OIL WATER RECT. SEPARATOR
HTC, SINGLE WALL, SLUGDE HOPPER

CUSTOMER: APPLIED PROCESS EQUIPMENT INC
SCOTTSDALE, AZ
PROJECT: ARIZONA A.N.G.
PHOENIX, AZ
QUOTE NO: 58904

SCALE:	DATE:	DWG. BY:	CHK'D BY	DWG. NO.:
1/2"=1'-0"	7-3-00	DW	DB	000703-DB

7/7/00

Highland Tank

One Highland Road
Stoystown, PA 15563

814-893-5701
FAX 814-893-5125

GENERAL NOTES

1. Highland Oil Water Separators have been designed as a primary separation system for the removal of free oil, grease, and settleable oily solids. It is the responsibility of the purchaser to obtain any approvals or permits which may be necessary for discharge or disposal of effluent and to review Highland Tank & Mfg. Co. product specifications and installation, operation and maintenance instructions to determine suitability for use. We assume no responsibility for contingent liability resulting from non-compliance with discharge regulations.

2. Highland Oil Water Separators will not remove oils with a specific gravity greater than 0.95, dissolved hydrocarbons, or Volatile Organic Compounds.

3. The amount of debris such as sand and organic matter permitted to enter the separator must be minimized for maximum performance.

4. Waste oil such as automobile and truck crank case oil should not be intentionally drained into the separator.

5. Highland Oil Water Separators should be maintained as free of accumulated oil and sediment as possible.

6. Highland Oil Water Separators must be filled with clean fresh water after installation and after all pumpout operations.

7. It is imperative that high-alkaline, non-biodegradable detergents and solvents be excluded from the separator system. The separator will not remove chemical emulsions and their presence retards the recovery of oil that would otherwise be separated.It is highly recommended if detergentis needed use Highland Cleaner.

8. The separator inlet and outlet piping must be sloped from 1/8" to 1/16" per foot to maintain proper gravity flow. Inlet piping should be installed straight and true with few turns to limit turbulence.

9. If pumping goes on ahead of the separator, it will tend to mix the oily water and increase the emulsified and dissolved oil content, possibly to the point that the oil and water separation fails. If a pump is installed upstream of the separator, it must be a positive displacement pump, at minimum gpm. and installed as far upstream as possible to reduce the extent of mixing.

10. For installation instructions refer to Highland Tank & Mfg. Co. instruction no. 2002-A for underground oil water separator tank with STI-P3 corrosion control system.

11. Manufactured in accordance with the STI-P3 specifications.

12. The Steel Tank Institute maintains "STI-P3" as a registered trademark.

* Notes 10, 11 & 12 apply only to STI-P3 tanks.

CAPACITY - 280 GALLON

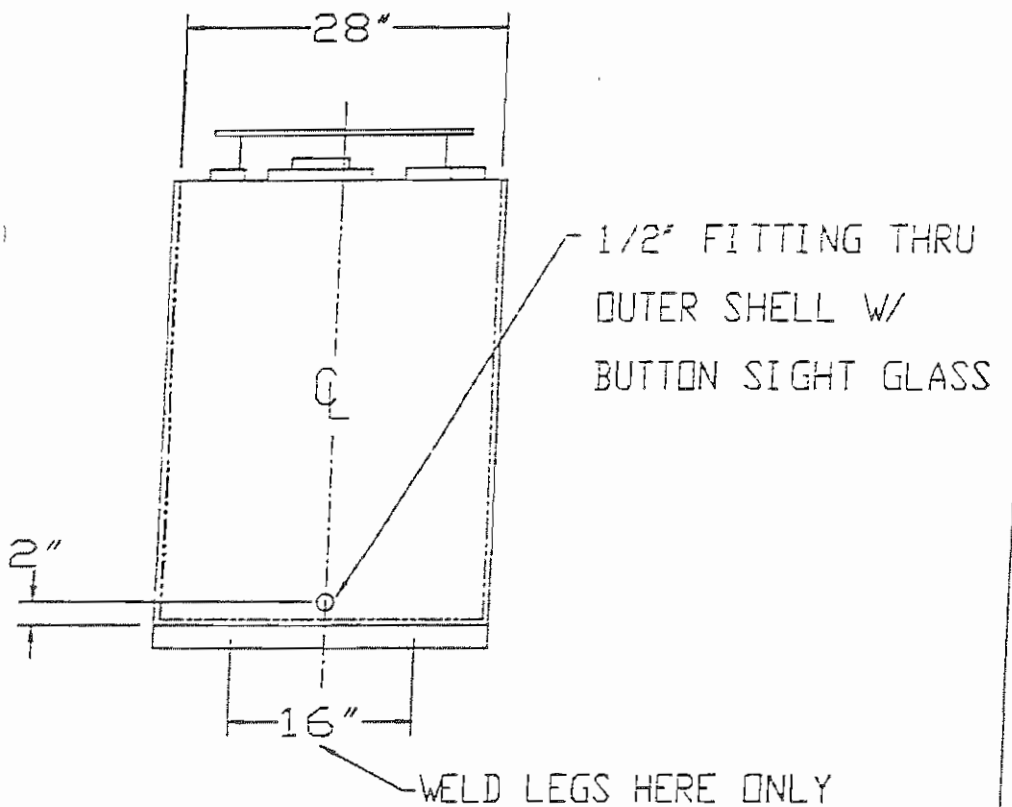
MATERIAL - 12 GA MILD CARBON STEEL

CONSTR - LAP WELD OUTSIDE ONLY

TEST - 2 PSIG

PAINT - RED PRIMER OUTSIDE ONLY

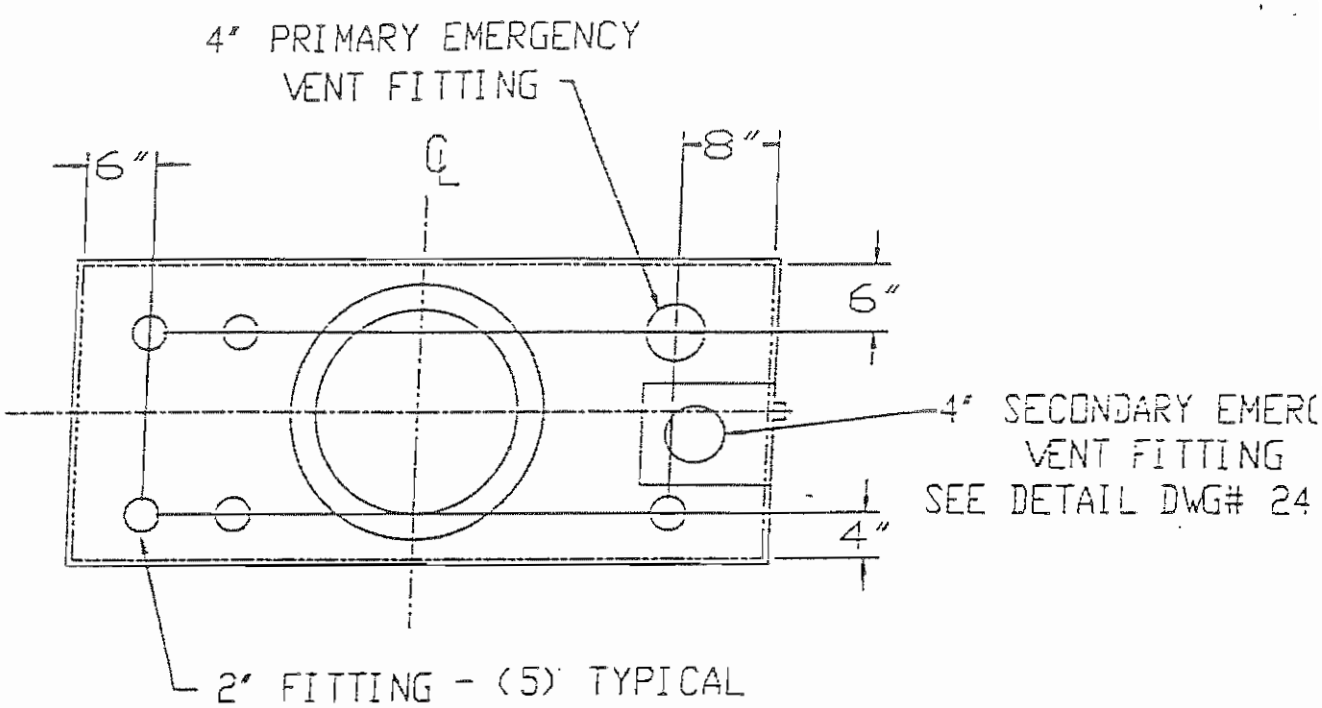
LABEL - UL142

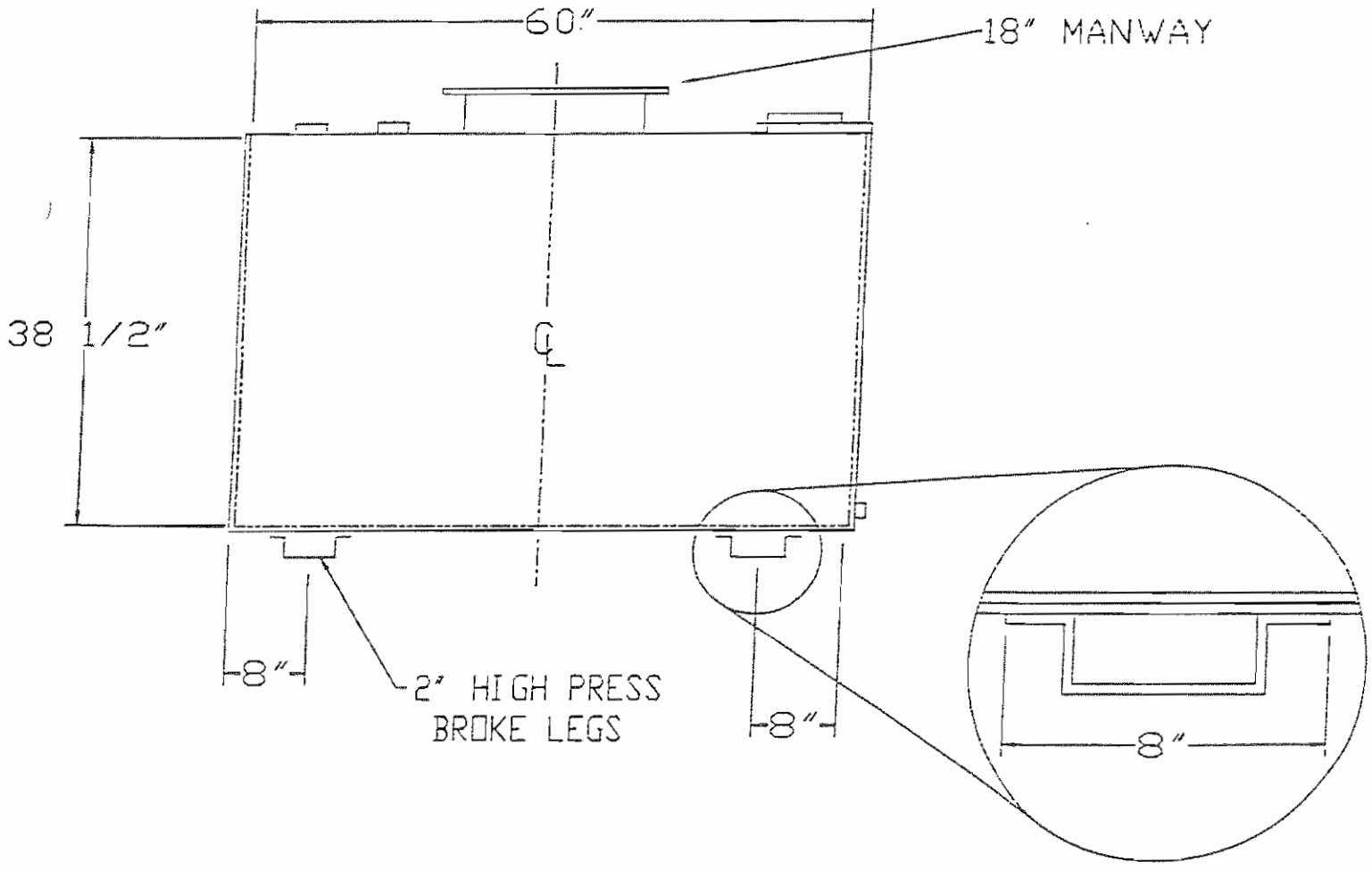


280 GAL DOUBLE WALL LUBE

HIGHLAND TANK AND MFG CO

TOMER	APPLIED PROCESS EQUIP. AZ. ARMY NATIONAL GUARD	REV DATE 3-11-97	REV NO 2
E 2" = 1'-0"	DATE 8/24/95	DRAWN BY DMH	DWG NO D12280-DW


4" PRIMARY EMERGENCY
VENT FITTING
6"
8"
6"
4" SECONDARY EMERG
VENT FITTING
SEE DETAIL DWG# 24
4"
2" FITTING - (5) TYPICAL


60"
18" MANWAY
38 1/2"
8"
2" HIGH PRESS
BROKE LEGS
8"
8"

Start-Up

Warnings

CAUTION: Separated liquid oil and vapors are flammable and/or combustible.

This system must be properly vented by installer in accordance with applicable plumbing and safety codes for venting of combustible gases.

Purchaser must be sure that the final state of all wiring complies with all applicable electrical and fire code standards.

Service personnel must comply with all established OSHA codes for facility and service. These include, but are not limited to, the use of approved breathing equipment, protective clothing, safety equipment, etc.

All electrical equipment, connections and wiring must be protected from submergence and infiltration of water.

Intrinsically safe sensor wiring must be kept in a separate conduit from non-intrinsically safe power wiring. Run non-intrinsically safe power wiring in steel conduit grounded at the panel end only.

Filling the Tank

Open the OWS inlet and outlet pipe valves.

Fill the OWS with clean, fresh water.

The OWS can be filled through the facility's drain leading to the OWS inlet or through a manway.

If filling by manway, place the hose through the 4" diameter Gauge Port in the Manway Cover or in the 24" diameter Manway so that hose outlet rests inside the OWS.

The OWS is full when water drains out of the Outlet. Check the water level using a gauge stick. The OWS is full when the level on the gauge stick equals the invert of the Outlet Pipe as measured from the OWS bottom.

To ensure that no blockage exists, allow water to flow through the facility drain which leads to the OWS Inlet. Check the Outlet Pipe to make sure that water is flowing through the OWS. Check the Inlet Pipe and facility's drain for water backup.

Prior to Oil Level Sensor Installation

Oil Level Controls (optional)

Check sensor with an OHM Meter. Both switches are normally closed in a low position (dry condition).

and/or

Connect the sensor to proper panel wiring (refer to specific panel wiring diagram supplied).

Switch on the panel.

Move the bottom float up and down on the probe stem. As the bottom float approaches the lower grip ring, High-High Oil Level Warning Alarm (red light and audible alarm) should activate.

Prior to Oil Level Sensor Installation (cont'd.)

Move the top float up and down on the probe stem. As the top float approaches the lower grip ring, the the High Oil Level warning alarm (an amber light) should activate.

Note: If one or both alarms do not activate properly, check the panel and sensor wiring for proper connections and continuity.

After Oil Level Sensor Installation

As installed OWS fills with water, both floats will be in low position (dry condition) and both alarms will be activated.

Note: If alarms are not activated, check the wiring connections.

When the OWS is almost full of water, the High-High Oil Level Warning Alarm should deactivate, and soon thereafter the High Oil Level Warning Alarm should deactivate.

Note: If the alarms do not deactivate upon filling, remove the sensor and check for float binding or poor electrical connections.

Maintenance

CAUTION: Separated liquid oil and vapors are flammable and/or combustible.

WARNING: Never enter an OWS or enclosed space, under any condition, without proper training and OSHA approved equipment. (Consult OSHA guidelines 29 CPR, Part 1910 "Permit Required Confined Spaces.")

All enclosed spaces must be properly vented prior to entry to avoid ignition of flammable materials or vapors.

Atmosphere must be properly tested for combustible vapors and oxygen prior to entry.

Entering the OWS without using a self-contained breathing apparatus may result in inhalation of hazardous fumes, causing headache, dizziness, nausea, loss of consciousness, and death. Required entry equipment includes, but is not limited to:

- Lifelines
- Safety harnesses (safety belts are unacceptable)
- Self-contained breathing apparatus
- Respirators (canister type)
- Rescue harness and ropes
- Horns, whistles, radios, etc. (for communication purposes)
- Explosion-proof lighting

Important: Be sure to inspect and replace manway gaskets as necessary when the OWS is shut-down for maintenance.

The coalescer plates and packs can be removed for cleaning or can be cleaned from above using a hot-water pressure wash with extension wand.

Mechanical lifting is required to remove the coalescer packs in large diameter OWS.

Inlet and effluent pipe valves should be closed prior to OWS entry.

All liquid must be removed from the OWS prior to entry.

Any and all oil recovered and removed from the OWS should be recycled or disposed of in accordance with federal, state, and local codes and regulations.

CAUTION: Interior surfaces of the OWS will be slippery.

OWS are designed for long-term, trouble-free operation. The following maintenance should be performed as needed or in accordance with a facility maintenance schedule.

Periodic inspection of:

- Upstream trench drains, sand interceptors, and traps
- Inside of the OWS for sand, trash, sludge and oil build-up
- Effluent for oils and other contaminants in accordance with local codes and permits
- Oil level in accordance with local codes and permits

OWS with oil level sensors require oil removal when the alarm is activated. Simply remove the oil, then refill OWS with clean water (see Start-Up Instructions).

(cont'd.)

OWS without oil level sensors require level checking by use of a gauge stick with oil/water sensing paste. If oil/water interface level is below that shown on the Oil Level Chart, oil needs to be removed and the OWS refilled with clean water.

WARNING: If the oil is not pumped out, the oil concentration in effluent may exceed the desired levels. Oil should only be removed during non-flow conditions to ensure pure oil draw-off.

If contaminants are found, close the valve on the inlet line, determine what the requirements are for restoring working order and take appropriate action.

For optimum performance, maintenance is required as needed or at least:

Once per year or when:

Bottom sludge in tank is 12" deep;

The effluent exhibits an oil sheen or contains high contaminant levels.

Inspect OWS after a heavy rainfall to check for signs of malfunction due to an excessive flow rate.

If the OWS has been cleaned within the year and only bottom sludge has built up while the effluent water is contaminant free, it may be sufficient to vacuum the sludge from the sediment chamber and refill OWS with clean water. (See Start-Up Instructions.)

Oil Removal Procedures

Important: Oil should only be removed during non-flow conditions to ensure pure oil draw-off.

Oil Removal Procedures (with optional oil level controls)

Be sure the High Oil Level Warning Alarm is activated because of an actual high oil level, otherwise a mixture of oil and water will be removed.

To minimize water contamination of the oil, connect the oil suction hose to the 4" diameter Oil Pump-out Pipe fitting/coupling.

Suction out the oil.

Refill OWS with clean water to deactivate the High Oil Level Warning Alarm. (See Start-Up Instructions.)

Oil Removal Procedures (without optional oil level controls)

Determine where the oil/water interface is using a gauge stick and oil/water sensing paste.

If the oil/water interface is less than the level found on the Oil Level Chart for your model, suction out the surface oil from the 4" diameter Gauge Port or the manway, otherwise a mixture of oil and water will be removed.

If the oil/water interface is equal to or greater than the level found on the Oil Level Chart, connect the oil suction hose to the 4" diameter Oil Pump-out Pipe fitting/coupling and suction out the oil.

Refill with clean water. (See Start-Up Instructions.)

Mixed Oil and Water Removal Procedures

Place a 3" or smaller suction hose inside the OWS through either the 4" diameter Gauge Port or through the Sediment Chamber Manway.

The suction hose nozzle should be 12" or higher above the OWS bottom. If nozzle extends closer to the bottom, sludge may be inadvertently removed.

Suction out OWS contents.

Refill with clean water. (See Start-up Instructions.)

Major Oil Spill Response Procedures

Important: A major oil spill is a spill which exceeds the normal oil storage capacity of the OWS.

In the event of a major spill, notify proper authorities as required by federal, state, and local laws.

After a major oil spill, the OWS should always be emptied, cleaned, and refilled with clean water.

Oil Spill Removal Procedures (with or without optional oil level controls)

If OWS has optional oil level controls, be sure the High and High-High Oil Level Warning Alarms are activated because of an actual High-High oil condition.

Determine exactly where the oil/water interface is located using a gauge stick and oil/water sensing paste.

Open the 4" diameter Gauge Port or Sediment Chamber Manway.

Apply oil/water sensing paste to a gauge stick.

Place gauge stick into the OWS through the 4" diameter Gauge Port or Manway to determine the oil/water interface location.

Place a 3" diameter or smaller suction hose inside the OWS through either the 4" diameter Gauge Port or through the Manway.

Lower hose to exact oil/water interface location. If the suction hose nozzle extends lower than the oil/water interface, water may be inadvertently removed with the oil.

Suction out the oil.

Refill with clean water. (See Start-Up instructions.)

If oil is still visible on the surface of the OWS or the alarms remain on, suction out the oil and refill with clean water.

Continue this sequence until only a sheen of oil is visible on the surface of the OWS or the alarms deactivate.

Sludge Removal Procedures

Determine exactly where the sludge/water interface is located using a wooden gauge stick.

Open the 4" diameter Gauge Port or Sediment Chamber Manway.

Place gauge stick into the OWS through the 4" diameter Gauge Port or Manway.

Slowly lower the gauge stick until it comes into contact with the sludge blanket. Mark the stick.

Push the stick downward until it comes into contact with the Striker Plate on the OWS bottom. Mark the stick.

The sludge depth is the difference between the two measurements.

Sludge Removal Procedures (for full OWS)

Place a 3" diameter or smaller suction hose inside the OWS through either the 4" diameter Gauge Port or through the Manway.

Lower hose to exact sludge/water interface location.

Suction out the sludge while slowly lowering the suction hose nozzle until it comes into contact with the Striker Plate on the OWS bottom.

Refill with clean water. (See Start-Up Instructions.)

Sludge Removal Procedures (for completely empty OWS)

Warning: Never enter an OWS or enclosed space, under any condition without proper training and OSHA approved equipment (Consult OSHA guidelines 29 CPR, Part 1910 "Permit Required Confined Spaces").

Suction out sludge and debris. Use caution to avoid internal coating damage.

Using a standard garden hose at normal pressure (40-70 PSIG), with or without a spray nozzle, loosen any caked oily solids. Use of hot water can be helpful.

Direct the water stream to the OWS wall side and bottom.

Suction out the resultant slurry.

General OWS Cleaning Procedures

If not properly maintained, the OWS may malfunction.

NOTE: Over a period of time sediment, oil, and grease will build up on the walls and floors of the OWS. Dirt and heavy oil may also build up on the Parallel Corrugated Plate Coalescer reducing the unit's efficiency. Also, the PETRO-SCREEN™ removes some suspended solids along with the small oil droplets in the wastewater. Periodic cleaning of the PETRO-SCREEN™ is also required.

Important: It is recommended that the OWS be cleaned as needed or at least once a year. Keep inspection and maintenance logs and have them available for ready reference.

Sediment Chamber

Remove manway cover over the 24" diameter manway to expose the Sediment Chamber. Be careful not to damage gasket.

Pump-out contents of OWS (see Mixed Oil and Water Removal Procedures).

Gauge the level of sand, dirt, or debris with wooden gauge stick.

Important: The level of sand, dirt, or debris should not be allowed to accumulate higher than 12" from the bottom of the OWS.

Remove the accumulated waste with a suction hose(See Sludge Removal procedures).

Direct a high pressure hose downward to loosen any caked oily solids on OWS sides and bottom.

NOTE: Use of high-temperature, high-pressure washing equipment along with Highland Cleaner can be helpful in OWS cleaning. Highland Cleaner is very effective and is 100% Biodegradable, non-emulsifying, and contains no Linear Activated Solvents (LAS), Phosphates, Ammonia, or Acids.

Attach spray nozzle wand extension to the high pressure hose.

Direct spray downward and toward the velocity head diffusion baffle to loosen up any caked oily solids that may have accumulated on inlet head.

Direct the spray to the OWS wall sides, top and bottom.

Remove the slurry with the suction hose.

Oil Water Separator Chamber

Disconnect all non-voltage carrying sensor lines to the Oil Level Sensor.

Carefully remove the Oil Level Sensor.

Carefully check the Oil Level Sensor floats. If the floats do not slide easily on the stem or have sludge on them, clean the Oil Level Sensor. Use a parts washer and mineral spirits to remove accumulated oil, grease, or sludge.

Check the Oil Level Sensor with an OHM meter to assure proper operation.

Place the Oil Level Sensor in a safe area to prevent damage.

Remove manway cover over the 24" diameter manway to expose the Oil Water Separation Chamber. Be careful not to damage the gasket.

Gauge the level of sand, dirt, or debris with wooden gauge stick.

Remove the accumulated waste with a suction hose(see Sludge Removal Procedures).

Direct a high pressure hose downward and around to loosen caked oily solids on OWS sides, top and bottom.

Attach spray nozzle wand extension to the high pressure hose.

Direct spray downward and toward the Parallel Corrugated Plate Coalescer to loosen up caked oily solids that may have accumulated on top of plates.

Oil Water Separator Chamber (cont'd.)

Flush the Parallel Corrugated Plate Coalescer from the outlet side to direct debris to Sediment Chamber.

NOTE: The coalescer packs must be cleaned of all sludge to operate properly.

Direct the spray to the OWS wall sides, top and bottom. Rotate the nozzle sufficiently and often so that all areas are reached with the spray.

Remove the slurry with a suction hose.

PETRO-SCREEN™ Coalescer

Important: Coalescer packs CAN BE cleaned in place or removed for cleaning. Mechanical lifting equipment is required to remove the coalescer packs in larger OWS.

Hook the Lifting Rod to the Lifting Lug on the coalescer pack and remove the coalescer pack directly below the manway.

Using the Lifting Rod, slide the next coalescer pack over and remove.

Continue until all coalescer packs have been removed and are above grade.

Place coalescer packs on oil absorbent blanket or sheet plastic.

NOTE: The coalescer packs should be moved to a convenient location upstream of the separator and washed to remove any gummy deposits.

Using a standard garden hose at normal pressure (40–70 PSIG) — with or without a spray nozzle — loosen any caked solids.

Flush the coalescer packs from both sides.

Let coalescer packs stand and dry.

Visually inspect the OWS interior and components for any damage.

NOTE: If any visual damage exists, contact the Highland Tank Field Service for further instructions.

Reinstall the coalescer packs.

The coalescer packs *must be* installed sitting on top of the bottom steel channel supports.

NOTE: Improper installation will result in separator malfunction.

Reattach the manway cover. Ensure the gasket is damage free.

Install the Oil Level Sensor in the 2" diameter Interface and Level Sensor Pipe.

Reconnect all non-voltage carrying sensor lines to the Oil Level Sensor.

Refer to OWS Start-Up Instructions for proper refilling and restarting procedures.

Oil Level Sensor Chart

For use with Control Panel "A1" on separators installed belowground with typical length manway extensions. Contact Highland Tank for information on separators with other burial depth.

Model HT/HTC	Size Diameter	Size Length	High-High Oil Level	High Oil Level	Typical Extension Length
550	3'6"	7'9"	59"	51"	38"
1,000	4'0"	10'9"	62"	52"	38"
2,000	5'4"	12'0"	69"	57"	38"
3,000	5'4"	18'0"	70"	57"	38"
4,000	5'4"	24'0"	70"	57"	38"
5,000	6'0"	23'10"	74"	60"	38"
6,000	6'0"	28'8"	86"	71"	50"
7,000	7'0"	24'4"	91"	75"	50"
8,000	7'0"	28'0"	91"	75"	50"
9,000	8'0"	24'0"	100"	82"	54"
10,000	8'0"	26'8"	100"	82"	54"
12,000	8'0"	32'0"	102"	84"	56"
15,000	10'0"	25'6"	115"	92"	58"
20,000	10'6"	31'0"	122"	97"	62"
25,000	10'6"	38'9"	125"	100"	65"
30,000	10'6"	46'6"	138"	114"	78"
40,000	12'0"	47'3"	146"	118"	78"
50,000	12'0"	59'0"	150"	122"	82"

NOTE: The total oil storage capacity figure does not account for oil that may accumulate within manways or fitting.

Important: If the oil/water interface is below the high oil level, oil should be pumped out of the OWS. The oil/water interface is defined as the point where the oil touches the water. Oil will always be floating on the water.

ATTACHMENT 6.

February 24, 1999

BE&K/Terranext Project No. 03103036

Mr. T. J. Roe, Project Manager
Arizona Department of Emergency & Military Affairs (ADEMA)
Army National Guard, FMO Environmental Office
5636 East McDowell Road
Phoenix, Arizona 85008-3495

HAND DELIVERED

Re: Transmittal of the *Owner's Operations Maintenance and Warranty Manual* for the Above Ground Oil-Water Separator at the Combined Services Maintenance Shop (CSMS) Wash Rack at the Papago Park Military Reservation Located Northeast of the Intersection of McDowell Road and 52nd Street in Phoenix, Arizona, ADEMA Project No. AZ14091002

Dear Mr. Roe:

BE&K/Terranext is pleased to submit this ***Owner's Operations Maintenance and Warranty Manual*** for the recently completed installation of an above ground oil-water separator system at the Combined Services Maintenance Shop (CSMS) located in the Papago Park Military Reservation. This manual outlines the operations requirements, periodic maintenance recommendations, project activities completed, the as-built piping locations, proposed project drawings, and copies of cut-sheets and warranty information for the equipment that was installed at the project site for your review and use.

OPERATIONAL REQUIREMENTS

All equipment, pumps, system piping, electrical connections, and sanitary connections have been installed in accordance with the appropriate Uniform Building Code, Uniform Plumbing Code, Uniform Electrical Code, and other appropriate Camp Navajo requirements.

The existing air compressor and air system piping which exists throughout the CSMS facility, should remain in 24-hour operation, at an operating pressure between 30 and 60 psi, to provide for continuous operation of the air-operated diaphragm pumps which were utilized for the new above ground oil-water separator system.

PERIODIC MAINTENANCE RECOMMENDATIONS

The above ground **oil-water separator** (OWS) selected for the project is a Model R-600-HTC, with sludge hopper, as manufactured by Highland Tank & Mfg. Co. of Stoystown, Pennsylvania. Copies of cut-sheets, fabrication drawings, performance test reports, and specifications are provided herein.

The oil collection section of the OWS should be flushed on a monthly schedule, by opening the bleed-off valve from the chamber to the 5-gallon collection container, for a short period to release the collected oils. The collected oils should then be taken to the Papago Park Military Reservation waste oil collection station for proper periodic disposal.

The fabric filter, located in the oil collection section of the OWS, should be carefully removed and cleaned with a high pressure water system on an annual basis. The sediment collection basin of the OWS should also be opened and flushed with a high pressure water system on an annual basis

The **2" air-operated diaphragm pumps** (AOD) selected for the project were manufactured by Graco. Copies of cut-sheets, drawings, and specifications are provided herein.

A simple logic **control panel box** was developed and constructed by a local manufacturer. A general description of the panel box is provided herein.

It is recommended that one copy of this manual be forwarded to the Maintenance Officer, of the CSMS for use at the facility.

Sincerely,

BE&K/TERRANEXT

Charles T. Sing, P.E.
Project Manager

Maintenance

CAUTION: Separated liquid oil and vapors are flammable and/or combustible.

WARNING: Never enter an OWS or enclosed space, under any condition, without proper training and OSHA approved equipment. (Consult OSHA guidelines 29 CPR, Part 1910 "Permit Required Confined Spaces.")

All enclosed spaces must be properly vented prior to entry to avoid ignition of flammable materials or vapors.

Atmosphere must be properly tested for combustible vapors and oxygen prior to entry.

Entering the OWS without using a self-contained breathing apparatus may result in inhalation of hazardous fumes, causing headache, dizziness, nausea, loss of consciousness, and death. Required entry equipment includes, but is not limited to:

- Lifelines
- Safety harnesses (safety belts are unacceptable)
- Self-contained breathing apparatus
- Respirators (canister type)
- Rescue harness and ropes
- Horns, whistles, radios, etc. (for communication purposes)
- Explosion-proof lighting

Important: Be sure to inspect and replace manway gaskets as necessary when the OWS is shut-down for maintenance.

The coalescer plates and packs can be removed for cleaning or can be cleaned from above using a hot-water pressure wash with extension wand.

Mechanical lifting is required to remove the coalescer packs in large diameter OWS.

Inlet and effluent pipe valves should be closed prior to OWS entry.

All liquid must be removed from the OWS prior to entry.

Any and all oil recovered and removed from the OWS should be recycled or disposed of in accordance with federal, state, and local codes and regulations.

CAUTION: Interior surfaces of the OWS will be slippery.

OWS are designed for long-term, trouble-free operation. The following maintenance should be performed as needed or in accordance with a facility maintenance schedule.

Periodic inspection of:

- Upstream trench drains, sand interceptors, and traps
- Inside of the OWS for sand, trash, sludge and oil build-up
- Effluent for oils and other contaminants in accordance with local codes and permits
- Oil level in accordance with local codes and permits

OWS with oil level sensors require oil removal when the alarm is activated. Simply remove the oil, then refill OWS with clean water (see Start-Up Instructions).

(cont'd.)

OWS without oil level sensors require level checking by use of a gauge stick with oil/water sensing paste. If oil/water interface level is below that shown on the Oil Level Chart, oil needs to be removed and the OWS refilled with clean water.

WARNING: If the oil is not pumped out, the oil concentration in effluent may exceed the desired levels. Oil should only be removed during non-flow conditions to ensure pure oil draw-off.

If contaminants are found, close the valve on the inlet line, determine what the requirements are for restoring working order and take appropriate action.

For optimum performance, maintenance is required as needed or at least:

Once per year or when:

Bottom sludge in tank is 12" deep;

The effluent exhibits an oil sheen or contains high contaminant levels.

Inspect OWS after a heavy rainfall to check for signs of malfunction due to an excessive flow rate.

If the OWS has been cleaned within the year and only bottom sludge has built up while the effluent water is contaminant free, it may be sufficient to vacuum the sludge from the sediment chamber and refill OWS with clean water. (See Start-Up Instructions.)

Oil Removal Procedures

Important: Oil should only be removed during non-flow conditions to ensure pure oil draw-off.

Oil Removal Procedures (with optional oil level controls)

Be sure the High Oil Level Warning Alarm is activated because of an actual high oil level, otherwise a mixture of oil and water will be removed.

To minimize water contamination of the oil, connect the oil suction hose to the 4" diameter Oil Pump-out Pipe fitting/coupling.

Suction out the oil.

Refill OWS with clean water to deactivate the High Oil Level Warning Alarm. (See Start-Up Instructions.)

Oil Removal Procedures (without optional oil level controls)

Determine where the oil/water interface is using a gauge stick and oil/water sensing paste.

If the oil/water interface is less than the level found on the Oil Level Chart for your model, suction out the surface oil from the 4" diameter Gauge Port or the manway, otherwise a mixture of oil and water will be removed.

If the oil/water interface is equal to or greater than the level found on the Oil Level Chart, connect the oil suction hose to the 4" diameter Oil Pump-out Pipe fitting/coupling and suction out the oil.

Refill with clean water. (See Start-Up Instructions.)

Mixed Oil and Water Removal Procedures

Place a 3" or smaller suction hose inside the OWS through either the 4" diameter Gauge Port or through the Sediment Chamber Manway.

The suction hose nozzle should be 12" or higher above the OWS bottom. If nozzle extends closer to the bottom, sludge may be inadvertently removed.

Suction out OWS contents.

Refill with clean water. (See Start-up Instructions.)

Major Oil Spill Response Procedures

Important: A major oil spill is a spill which exceeds the normal oil storage capacity of the OWS.

In the event of a major spill, notify proper authorities as required by federal, state, and local laws.

After a major oil spill, the OWS should always be emptied, cleaned, and refilled with clean water.

Oil Spill Removal Procedures (with or without optional oil level controls)

If OWS has optional oil level controls, be sure the High and High-High Oil Level Warning Alarms are activated because of an actual High-High oil condition.

Determine exactly where the oil/water interface is located using a gauge stick and oil/water sensing paste.

Open the 4" diameter Gauge Port or Sediment Chamber Manway.

Apply oil/water sensing paste to a gauge stick.

Place gauge stick into the OWS through the 4" diameter Gauge Port or Manway to determine the oil/water interface location.

Place a 3" diameter or smaller suction hose inside the OWS through either the 4" diameter Gauge Port or through the Manway.

Lower hose to exact oil/water interface location. If the suction hose nozzle extends lower than the oil/water interface, water may be inadvertenily removed with the oil.

Suction out the oil.

Refill with clean water. (See Start-Up instructions.)

If oil is still visible on the surface of the OWS or the alarms remain on, suction out the oil and refill with clean water.

Continue this sequence until only a sheen of oil is visible on the surface of the OWS or the alarms deactivate.

Sludge Removal Procedures

Determine exactly where the sludge/water interface is located using a wooden gauge stick.

Open the 4" diameter Gauge Port or Sediment Chamber Manway.

Place gauge stick into the OWS through the 4" diameter Gauge Port or Manway.

Slowly lower the gauge stick until it comes into contact with the sludge blanket. Mark the stick.

Push the stick downward until it comes into contact with the Striker Plate on the OWS bottom. Mark the stick.

The sludge depth is the difference between the two measurements.

Sludge Removal Procedures (for full OWS)

Place a 3" diameter or smaller suction hose inside the OWS through either the 4" diameter Gauge Port or through the Manway.

Lower hose to exact sludge/water interface location.

Suction out the sludge while slowly lowering the suction hose nozzle until it comes into contact with the Striker Plate on the OWS bottom.

Refill with clean water. (See Start-Up Instructions.)

Sludge Removal Procedures (for completely empty OWS)

Warning: Never enter an OWS or enclosed space, under any condition without proper training and OSHA approved equipment (Consult OSHA guidelines 29 CPR, Part 1910 "Permit Required Confined Spaces").

Suction out sludge and debris. Use caution to avoid internal coating damage.

Using a standard garden hose at normal pressure (40-70 PSIG), with or without a spray nozzle, loosen any caked oily solids. Use of hot water can be helpful.

Direct the water stream to the OWS wall side and bottom.

Suction out the resultant slurry.

General OWS Cleaning Procedures

If not properly maintained, the OWS may malfunction.

NOTE: Over a period of time sediment, oil, and grease will build up on the walls and floors of the OWS. Dirt and heavy oil may also build up on the Parallel Corrugated Plate Coalescer reducing the unit's efficiency. Also, the PETRO-SCREEN™ removes some suspended solids along with the small oil droplets in the wastewater. Periodic cleaning of the PETRO-SCREEN™ is also required.

Important: It is recommended that the OWS be cleaned as needed or at least once a year. Keep inspection and maintenance logs and have them available for ready reference.

Sediment Chamber

Remove manway cover over the 24" diameter manway to expose the Sediment Chamber. Be careful not to damage gasket.

Pump-out contents of OWS (see Mixed Oil and Water Removal Procedures).

Gauge the level of sand, dirt, or debris with wooden gauge stick.

Important: The level of sand, dirt, or debris should not be allowed to accumulate higher than 12" from the bottom of the OWS.

Remove the accumulated waste with a suction hose(See Sludge Removal procedures).

Direct a high pressure hose downward to loosen any caked oily solids on OWS sides and bottom.

NOTE: Use of high-temperature, high-pressure washing equipment along with Highland Cleaner can be helpful in OWS cleaning. Highland Cleaner is very effective and is 100% Biodegradable, non-emulsifying, and contains no Linear Activated Solvents (LAS), Phosphates, Ammonia, or Acids.

Attach spray nozzle wand extension to the high pressure hose.

Direct spray downward and toward the velocity head diffusion baffle to loosen up any caked oily solids that may have accumulated on inlet head.

Direct the spray to the OWS wall sides, top and bottom.

Remove the slurry with the suction hose.

Oil Water Separator Chamber

Disconnect all non-voltage carrying sensor lines to the Oil Level Sensor.

Carefully remove the Oil Level Sensor.

Carefully check the Oil Level Sensor floats. If the floats do not slide easily on the stem or have sludge on them, clean the Oil Level Sensor. Use a parts washer and mineral spirits to remove accumulated oil, grease, or sludge.

Check the Oil Level Sensor with an OHM meter to assure proper operation.

Place the Oil Level Sensor in a safe area to prevent damage.

Remove manway cover over the 24" diameter manway to expose the Oil Water Separation Chamber. Be careful not to damage the gasket.

Gauge the level of sand, dirt, or debris with wooden gauge stick.

Remove the accumulated waste with a suction hose(see Sludge Removal Procedures).

Direct a high pressure hose downward and around to loosen caked oily solids on OWS sides, top and bottom.

Attach spray nozzle wand extension to the high pressure hose.

Direct spray downward and toward the Parallel Corrugated Plate Coalescer to loosen up caked oily solids that may have accumulated on top of plates.

Oil Water Separator Chamber (cont'd.)

Flush the Parallel Corrugated Plate Coalescer from the outlet side to direct debris to Sediment Chamber.

NOTE: The coalescer packs must be cleaned of all sludge to operate properly.

Direct the spray to the OWS wall sides, top and bottom. Rotate the nozzle sufficiently and often so that all areas are reached with the spray.

Remove the slurry with a suction hose.

PETRO-SCREEN™ Coalescer

Important: Coalescer packs CAN BE cleaned in place or removed for cleaning. Mechanical lifting equipment is required to remove the coalescer packs in larger OWS.

Hook the Lifting Rod to the Lifting Lug on the coalescer pack and remove the coalescer pack directly below the manway.

Using the Lifting Rod, slide the next coalescer pack over and remove.

Continue until all coalescer packs have been removed and are above grade.

Place coalescer packs on oil absorbent blanket or sheet plastic.

NOTE: The coalescer packs should be moved to a convenient location upstream of the separator and washed to remove any gummy deposits.

Using a standard garden hose at normal pressure (40–70 PSIG) — with or without a spray nozzle — loosen any caked solids.

Flush the coalescer packs from both sides.

Let coalescer packs stand and dry.

Visually inspect the OWS interior and components for any damage.

NOTE: If any visual damage exists, contact the Highland Tank Field Service for further instructions.

Reinstall the coalescer packs.

The coalescer packs *must be* installed sitting on top of the bottom steel channel supports.

NOTE: Improper installation will result in separator malfunction.

Reattach the manway cover. Ensure the gasket is damage free.

Install the Oil Level Sensor in the 2" diameter Interface and Level Sensor Pipe.

Reconnect all non-voltage carrying sensor lines to the Oil Level Sensor.

Refer to OWS Start-Up Instructions for proper refilling and restarting procedures.

Start-Up

Warnings

CAUTION: Separated liquid oil and vapors are flammable and/or combustible.

This system must be properly vented by installer in accordance with applicable plumbing and safety codes for venting of combustible gases.

Purchaser must be sure that the final state of all wiring complies with all applicable electrical and fire code standards.

Service personnel must comply with all established OSHA codes for facility and service. These include, but are not limited to, the use of approved breathing equipment, protective clothing, safety equipment, etc.

All electrical equipment, connections and wiring must be protected from submergence and infiltration of water.

Intrinsically safe sensor wiring must be kept in a separate conduit from non-intrinsically safe power wiring. Run non-intrinsically safe power wiring in steel conduit grounded at the panel end only.

Filling the Tank

Open the OWS inlet and outlet pipe valves.

Fill the OWS with clean, fresh water.

The OWS can be filled through the facility's drain leading to the OWS inlet or through a manway.

If filling by manway, place the hose through the 4" diameter Gauge Port in the Manway Cover or in the 24" diameter Manway so that hose outlet rests inside the OWS.

The OWS is full when water drains out of the Outlet. Check the water level using a gauge stick. The OWS is full when the level on the gauge stick equals the invert of the Outlet Pipe as measured from the OWS bottom.

To ensure that no blockage exists, allow water to flow through the facility drain which leads to the OWS Inlet. Check the Outlet Pipe to make sure that water is flowing through the OWS. Check the Inlet Pipe and facility's drain for water backup.

Prior to Oil Level Sensor Installation

Oil Level Controls (optional)

Check sensor with an OHM Meter. Both switches are normally closed in a low position (dry condition).

and/or

Connect the sensor to proper panel wiring (refer to specific panel wiring diagram supplied).

Switch on the panel.

Move the bottom float up and down on the probe stem. As the bottom float approaches the lower grip ring, High-High Oil Level Warning Alarm (red light and audible alarm) should activate.

Prior to Oil Level Sensor Installation (cont'd.)

Move the top float up and down on the probe stem. As the top float approaches the lower grip ring, the the High Oil Level warning alarm (an amber light) should activate.

Note: If one or both alarms do not activate properly, check the panel and sensor wiring for proper connections and continuity.

After Oil Level Sensor Installation

As installed OWS fills with water, both floats will be in low position (dry condition) and both alarms will be activated.

Note: If alarms are not activated, check the wiring connections.

When the OWS is almost full of water, the High-High Oil Level Warning Alarm should deactivate, and soon thereafter the High Oil Level Warning Alarm should deactivate.

Note: If the alarms do not deactivate upon filling, remove the sensor and check for float binding or poor electrical connections.

Highland Tank

One Highland Road
Stoystown, PA 15563

814-893-5701
FAX 814-893-6126

Oil Water Separator Cleanout Procedure

The Highland Tank & Mfg. Co. Oil Water Separator is designed to receive, directly from the wastewater drains, various kinds of oil, gasolines, grease and other volatile liquid wastes along with heavy oily sludges; they retain this harmful waste matter and prevent its entry into the drainage system. If not properly maintained, the Highland Tank & Mfg. Co. Oil Water Separator will clog and malfunction. Attached are instructions for pumping out and cleaning the oil water separator. This procedure will allow maintenance and cleaning from above.

NOTE: If for any reason personnel must enter the separator, follow safety procedures for entering an explosive and dangerous atmosphere established by OSHA and NFPA.

Maintenance procedure for each chamber are as follows:

1. Preseparator Chamber:

Remove the top cover plate from the oil water separator to expose the pre-separator chamber. Gauge the level of sand, dirt, or debris with wooden gauge stick. Remove the accumulated material with a suction hose from a vacuum vehicle or portable sludge pump. Pump-out all accumulated material from the pre-separator chamber. While pumping out the chamber, it may be necessary to direct a high pressure hose downward to loosen up any caked oily solids. With an extension nozzle on the high pressure hose, direct a high pressure hose downward and toward the velocity head diffusion baffle to loosen up any caked oily solids that may have accumulated on the inlet head of the oil water separator. Remove the slurry with the suction hose.

2. Separator Chamber:

Disconnect all voltage carrying power lines to the pump. Disconnect all non-voltage carrying sensor lines to the level sensor. Carefully remove the equipment from the oil water separator. Carefully clean the equipment so as to allow any oily water to flow into the oil water separator. Place the equipment in a safe area to prevent damage. Remove the top cover plate from the oil water separator to expose the pre-separator chamber. Gauge the level of sand, dirt, or debris with a wooden gauge stick. Remove the accumulated material with a suction hose from a vacuum vehicle or portable sludge pump. Pump-out all accumulated material from the separator chamber. While pumping out the chamber, it may be necessary to direct a high-pressure hose downward to loosen up any caked oily solids. Remove the slurry with he suction hose. With an extension nozzle on the high pressure hose, direct a high pressure hose downward and toward the parallel plate pack to loosen up any caked oily solids that may have accumulated on the top of the plates. Remove the slurry with the suction hose.

NOTE: When pumping out the pre-separator chamber and the separator chamber, alternate pump-out from chamber to chamber so that the solid level is reduced evenly across the oil water separator. This is to prevent damage to the internal parallel plate pack.

3. Oil Chamber:

Disconnect all non-voltage carrying sensor lines to the level sensor. Carefully remove the equipment from the oil water separator. Carefully clean the equipment so as to allow any oily water to flow into the oil water separator. Place the equipment in a safe area to prevent damage. Remove the top cover plate from the oil water separator to expose the oil chamber. Gauge the level of oil/water with a wooden gauge stick. Remove the accumulated oil/water with a suction hose from a vacuum vehicle or portable sludge pump. Pump-out all accumulated oil/water from the oil chamber. With an extension nozzle on the high pressure hose, direct a high pressure hose downward and around the chamber to remove any caked oil from the sides of the chamber. Remove the waste with the suction hose.

Highland Tank

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4. "PETRO-SCREEN" Coalescer

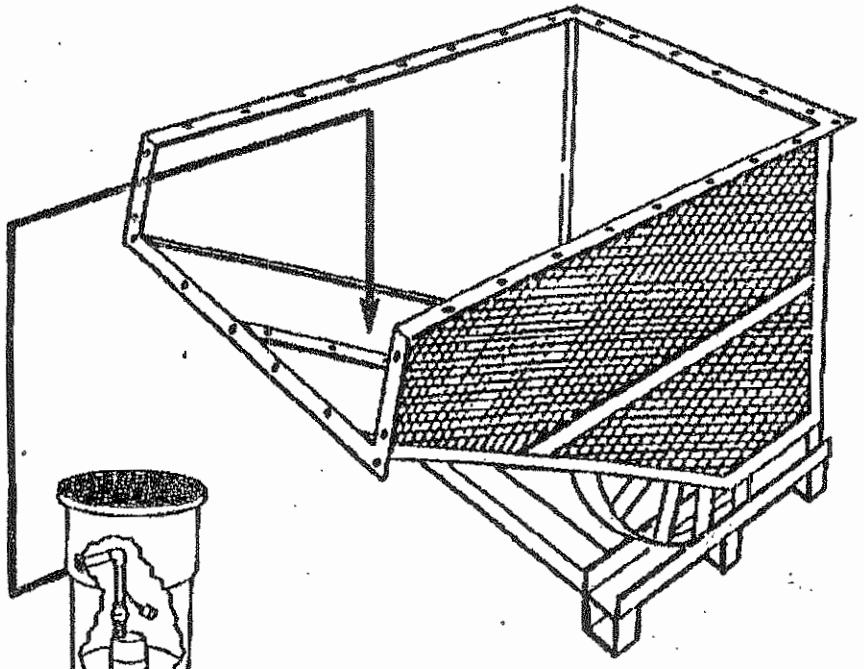
The "PETRO-SCREEN" filter/coalescer packs can be easily removed from above by removing the manhole cover and pulling the cartridges out by use of their lifting hooks. The filter/coalescer packs should be moved to a convenient location upstream of the separator and washed using a high-pressure hose to remove any debris or gummy deposits that have accumulated on the fibers. Remove all traces of any detergent before replacing thecoalescer packs. Replace the coalescer packs and manhole cover.

Finally, check the level sensors with an OHM meter to assure proper operation. Install the level sensors and pump in the oil water separator. Fill the oil water separator with clean fresh water. Note that the separator must be free of all detergent before refilling with clean fresh water.

Replace all equipment, manhole covers etc. Reconnect sensors and voltage carrying power lines.

Refer to "Operation and Maintenance Instructions" earlier in this section for routine maintenance.

2 Yard Solids Collection & Dewatering Filter



Item # OP-048

Item # OP-026

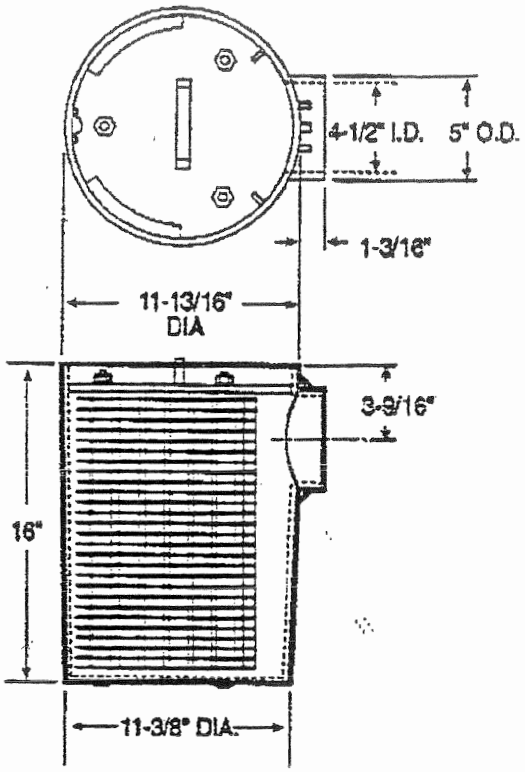
RGF's Self-flushing 2 Yard Solids Collection and Dewatering Filter is designed to remove heavy solids from the waste stream and collect for disposal. Filters to 170 micron particle size. System requires lift truck for dumping. Available in two materials: aluminum for light weight material collection, or carbon steel for heavy weight materials. Requires a below grade sump basin to be located under the filter to catch and transfer filtered water.

- *Dimensions:* 4'6"W x 4'4"H x 5'6"L
- *Construction:* OP-026: aluminum frame
  OP-047: A-36 carbon steel frame
- *Sump Basin:* Optional OP-048 Heavy Duty Sump Basin
  1/2 h.p Sump Pump 115 VAC, 50/60 Hz, 9.8 Amps

Item #	*Description*	*Capacity*	*Filter*	*Construction*	*Ship Wt.*
OP-026	2-Yard Dewatering Filter - light weight	2 Cubic Yards	170 micron s.s. mesh	Aluminum	297 lbs.
OP-047	2-Yard Dewatering Filter - heavy duty	2 Cubic Yards	170 micron s.s. mesh	A-36 Carbon Steel	Call
OP-048	Optional Sump Basin Assembly	40 gallons	---	---	12 lbs.

* Specification Sheet Available *

A100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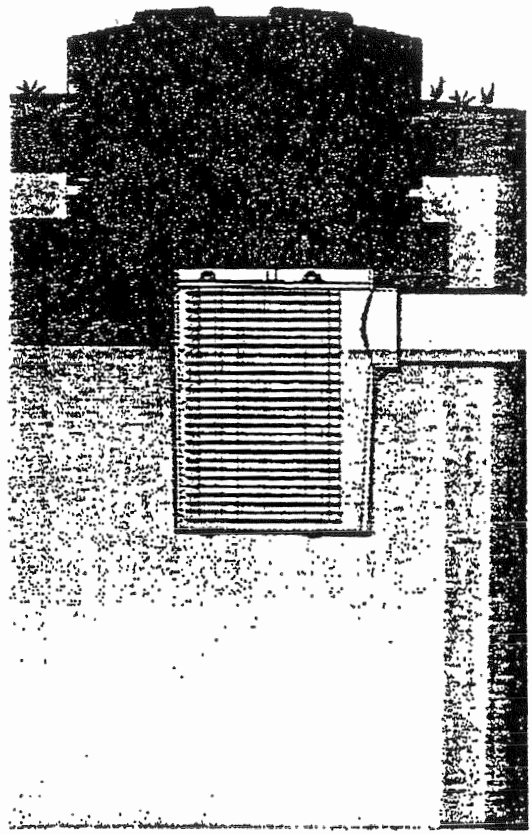
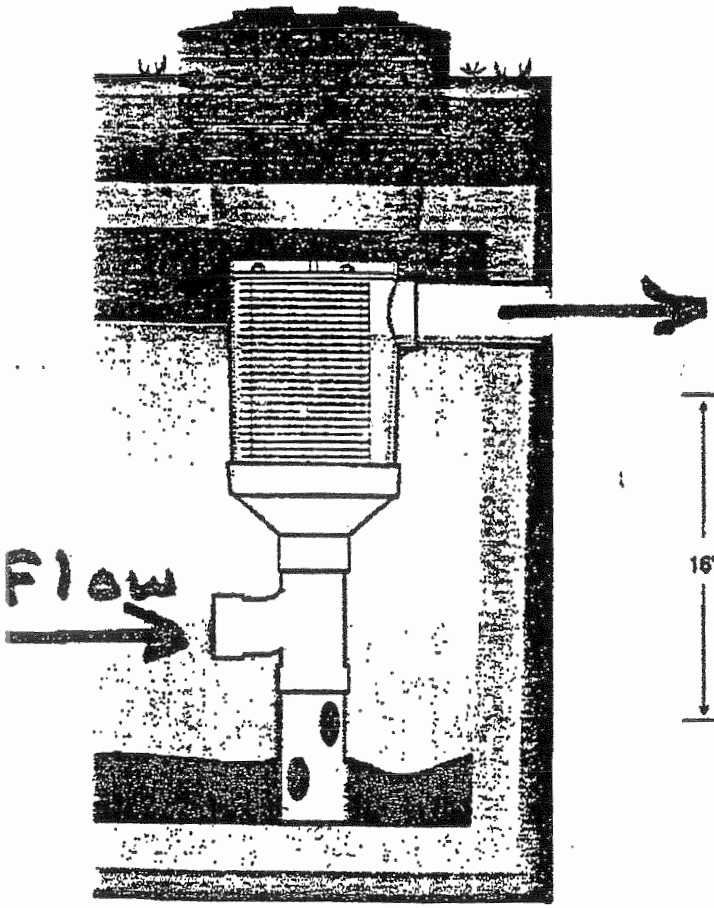
1-3/16"
11-13/16" DIA
3-9/16"
16"
11-3/8" DIA.

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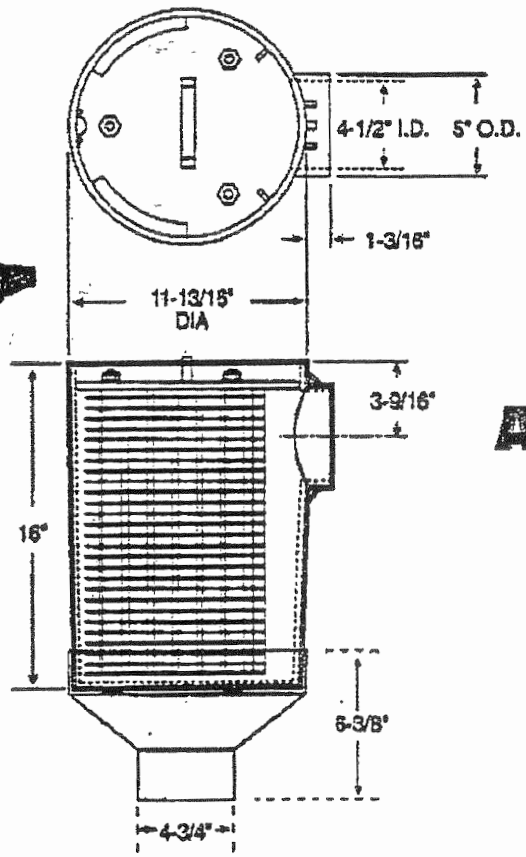
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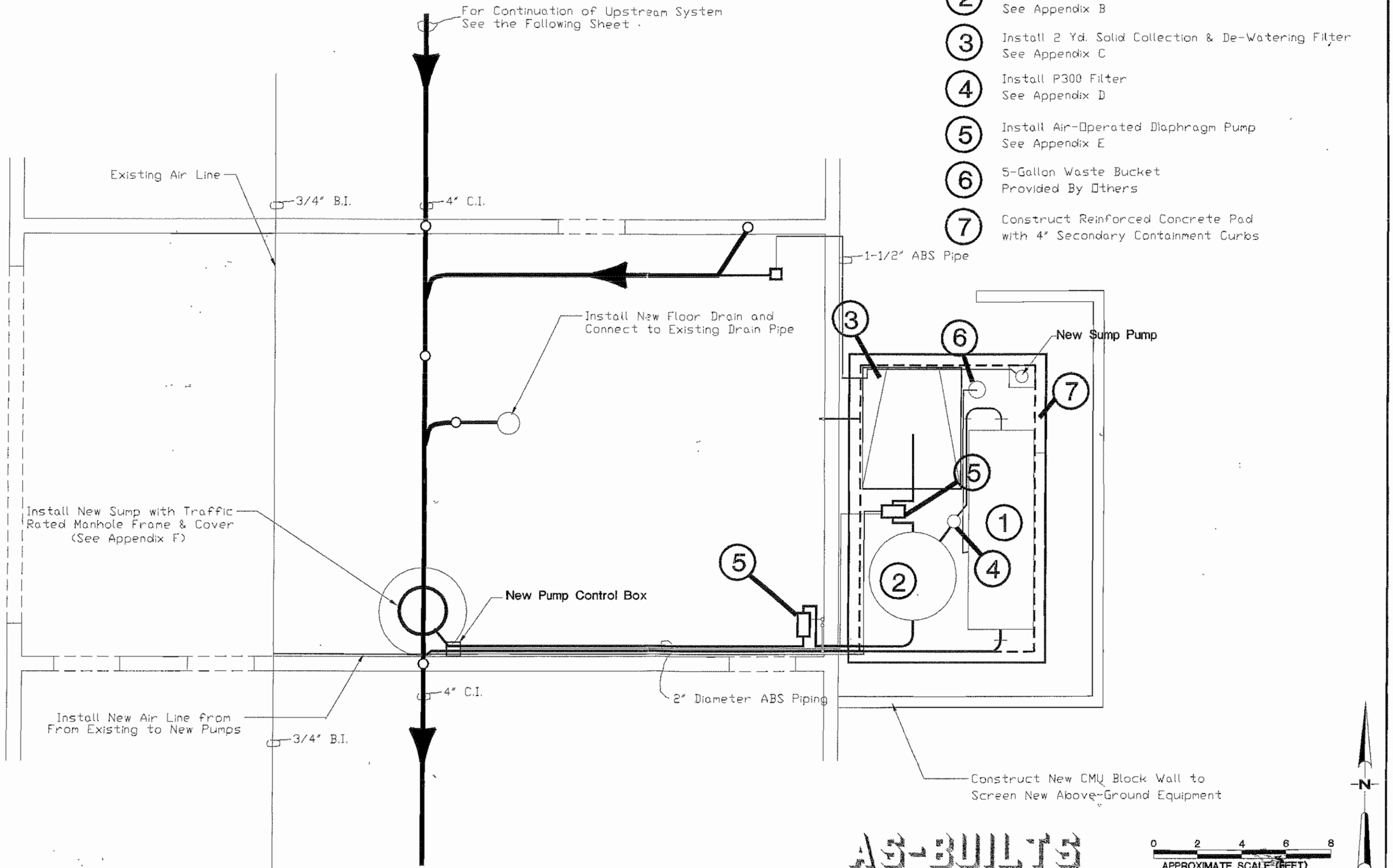
5" O.D.
1-3/16"
11-13/16" DIA
3-9/16"
16"
6-3/8"
4-3/4"

A300

1. Install New Oil-Water Separator
   See Appendix A
2. Install 500-gallon Cone Bottom Tank
   See Appendix B
3. Install 2 Yd. Solid Collection & De-Watering Filter
   See Appendix C
4. Install P300 Filter
   See Appendix D
5. Install Air-Operated Diaphragm Pump
   See Appendix E
6. 5-Gallon Waste Bucket
   Provided By Others
7. Construct Reinforced Concrete Pad
   with 4" Secondary Containment Curbs



AS-BUILTS

TerraNext

CSMS OIL-WATER SEPARATOR
LOCATION PLAN
Arizona National Guard
Papago Park Military Reservation
Phoenix, Arizona

Project No.: 03103008 | Date: 02/21/03
Drafted By: C. Sing | Checked By: C. Sing

Sheet 1 of - Sheets Shown

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ATTACHMENT 7.

CONSTRUCTION REPORT AND OPERATION AND MAINTENANCE MANUAL

SILVERBELL ARMY HELIPORT FACILITY
OMS-3 WASHRACK
OIL-WATER SEPARATOR SYSTEM

Prepared For:
ARIZONA ARMY NATIONAL GUARD
PROJECT NO. AZ10395001

Prepared By:
DAMES & MOORE - PHOENIX, ARIZONA

D&M Job No. 29679-004-033
JUNE 4, 1999

TABLE OF CONTENTS

LIST OF APPENDICES

A Photographic Log
   1. Highland Supplied, Double-Wall, Steel, OWS
   2. Effluent Conveyance Piping with Cleanouts
   3. Manhole MH#1 With Conveyance Piping
   4. OWS Vent Piping
   5. Solar-Powered Alarm Cabinet
   6. Solar-Panels Mounted Above Alarm Cabinet
   7. OWS Coalescer Pack (1 of 3)
   8. OWS Surface Completion

B Highland Oil/Water Separator User's Manual

C Level Controls

D Solar Panels

E As-Built Drawing

O&M MANUAL DISTRIBUTION LIST

Name	Firm	Number of Copies	Complete Manual or Summary	Phone Numbers
Cortney Brand	Dames & Moore – Project Manager	1	Complete	(602) 371-1110
Greg Hegge	Dames & Moore – Field Manager	1	Complete	(602) 371-1110
David Annis	AZARNG-Environmental Projects	4	Complete	(602) 267-2974

1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

The oil/water separator (OWS) system was designed by Dames & Moore to collect oil/water from the Organization Maintenance Shop #3 (OMS-3) wash racks located at the Silverbell Army Heliport Facility at the Pinal Air Park in Marana, Arizona.

Liquids from the wash racks were previously conveyed to an underground oil and sand interceptor and to an injection well located at the site. The injection well was properly decommissioned and administratively closed by D&M and is discussed in the following report:

- Dames & Moore, 1999. Closure Report, Class V Injection Well, Arizona Army National Guard, Organizational Maintenance Shop #3, Silverbell Army Heliport. January 8.

The OWS System processes oil/water liquids which are conveyed from the wash racks at the site. The wash racks are used by the facility for cleaning various types of equipment and vehicles. The wash racks only receive wash water from routine operations and do not receive significant quantities of storm water run off. The wash water containing both water and oily liquids are collected from the wash racks and gravity drain into the existing underground interceptor. The underground interceptor will continue to be used to collect sand, grit, and other dense solids. Oil/water is gravity drained from the interceptor into the new underground OWS. Recovered oil is stored within the OWS until being removed by a service contractor and properly disposed or recycled. Treated effluent is then gravity drained to the sanitary sewer and is handled by the facility wastewater department.

1.2 OIL/WATER SEPARATOR SYSTEM CONSTRUCTION

The construction of the OWS system was subcontracted to Environmental Response, Inc. and was overseen by a Dames & Moore Project Engineer. Construction commenced on May 10, 1999 and was completed on May 14, 1999. The construction of the system involved locating existing utilities, trenching and excavation, and the installation of the new OWS and associated piping and controls. An As-Built drawing of the system is provided as Appendix E.

1.3 INTENT OF OPERATION & MAINTENANCE MANUAL

The OWS system has been designed and installed to operate "automatically". However, some operation and maintenance by operators familiar with the system is required. The purpose of the

Operation and Maintenance (O&M) Manual is to provide the operator with guidance to conduct the following:

- Operate and monitor the system properly.
- Manage the oil that is recovered.
- Maintain the equipment to ensure the various components are functioning.
- Keep appropriate logs and records.

The written portion of the manual relies on the manufacturer's instructions and data in the appendices to cover the majority of the details that may be required to operate, maintain, and troubleshoot individual components of the system.

IMPORTANT!

The operator should refer to the *Table of Contents* to identify the appropriate appendix that contains manufacturer data for the respective system component. Appendices are not referenced in the body of the text.

The O&M Manual also serves as a construction report to generally document the system as-constructed conditions, including CAD-generated as-built drawings. Copies of selected photographs depict the major components of the installed system included in the appendices.

2.0 DESCRIPTION OF SYSTEM

2.1 OIL-WATER SEPARATOR SYSTEM

The OWS, Model # HTC-ACT-100-U, is manufactured by Highland Tank & MFG. Co. The separator vessel is installed below ground to receive gravity flow from OMS-3 wash racks. The separator system is constructed in a three-chamber configuration utilizing natural gravity separation, liquid residence time, as well as skimming and underflow principles. The system is further enhanced by a coalescer to attract oil droplets, retain them until they are larger, and promote the droplets to rise to the surface more effectively by the slanted plates. The coalescer follows Stokes' Law of gravity separation that the larger the droplet the faster it will rise and separate. The separator system consists of the following:

- Overall size of 42 inches in diameter and 8 feet in length.
- Total liquid capacity of 550 gallons.
- Double wall construction; 7 GA inner shell, 10 GA outer shell.
- Factory-rated at 55-gpm capacity.
- Factory-coated interior for corrosion resistance, 10-15 mil Corrocote PW™.
- Factory-coated exterior for corrosion resistance, 70 mil FiberThane™ polyurethane.
- Oil reservoir capacity of 110 gallons (normal mode).
- Vessel baffles that contain 240 gallons of oil in a spill situation (emergency mode).
- Two 18-inch access manways.
- Parallel corrugated plate coalescer
- Three Petro-Screen™ polypropylene coalescer packs.
- Interstitial monitoring tube (2-inch).
- Oil removal tube (4-inch).
- 4-inch water outlet (flanged).
- 4-inch inlet (flanged).
- Total vessel weight of 2,716 pounds (less accessories and liquids).

The inlet chamber is equipped with a parallel corrugated plate coalescer to enhance the initial oil-water separation. At the bottom of the inlet chamber is a sludge containment compartment that collects any sludge material and/or foreign material that may be conveyed through the system. Sludge removal from the inlet chamber can be performed by removing the manway cover above the sediment chamber and using a vacuum truck to remove the sediment. The oil/water then flows through a second series of coalescer packs to intercept droplets of oil too small to be

removed by the parallel plate coalescer. The floating oil in the OWS is stored within the tank until activation of a high level switch within the chamber. The high level switch, when activated, will illuminate an amber light on the alarm cabinet, indicating that the OWS requires oil removal. The reclaimed oil will then require removal by a service contractor or other qualified individual to pump out the oil and handle proper recycling or disposal. Treated water in the separator is forced to the outlet chamber by inflows via the underflow pipe. The water then gravity drains from this chamber through manhole MH#1 and then into the sanitary sewer system. Another feature of the oil-water separator is an interstitial monitoring tube that allows inspection of the OWS interstitial space.

2.2 INLET/OUTLET PIPING

Inlet and outlet conveyance piping is constructed of schedule 40 polyvinyl chloride (PVC) and is sloped to accommodate the existing structures and to maximize liquid flow velocity. Wash water which may contain significant amounts of sediment is conveyed to the existing interceptor prior to the OWS.

2.3 INTERCEPTOR MODIFICATION

The existing sediment interceptor was modified during OWS installation to allow for floating oils and liquids to pass through the interceptor into the OWS for removal. This modification was completed by breaking an additional opening in the internal concrete wall at approximately the same elevation as the outlet piping. The interceptor will continue to remove sand and grit as designed. A diagram of this modification is included in the as-built details.

2.4 SOLAR PANEL SYSTEM AND ALARM CABINET

The high level alarm for the OWS, when activated, will illuminate an amber light on the alarm cabinet until the oil is removed from the OWS and re-filled with water. During illumination, the amber light is powered by a pair of 12 volt nickel-cadmium batteries connected in series. The batteries are kept charged by a pair of 1.40 mA 12 volt solar panels, also connected in series. No routine maintenance is required for either the solar panels or the batteries.

3.0 OPERATION DESCRIPTION

3.1 OIL-WATER SEPARATOR SYSTEM OPERATION

The description of the sequence of operations for the Oil-Water Separator System is as follows:

1. Oil/water enters the oil-water separator from the OMS-3 wash racks and is directed through a coalescer mesh pak, which separates the oil from the water.

2. The layer of oil atop the water collects within the OWS.

3. The layer of water beneath the oil flows through a subsurface conveyance pipe and into an effluent water only chamber.

4. The effluent water gravity flows out of the separator and into the sanitary sewer system.

5. The oil collected in the OWS rises until the high level switch is activated and the amber indicator light at the alarm cabinet is ON.

6. The oil in the OWS is then pumped out of the chamber by a qualified service contractor or individual and is handled appropriately for offsite recycling or disposal. The amber indicator light at the alarm cabinet will now be OFF.

7. Troubleshooting and notification of the appropriate personnel is required if the amber indicator light remains on after a pump-out of oil from the OWS or if the indicator fails to function properly.

8. In the event of a leak in the double wall construction of the OWS, liquid will be present and detectable by inspection of the monitoring tube.

IMPORTANT!

Troubleshooting and notification of the appropriate personnel is required if liquid is detected in the OWS interstitial space.

3.2 HIGH-LEVEL SENSOR

The Oil-Water Separator System has one level sensor, a high-level sensor that will be activated by the declining level of water in the OWS, indicating an increasing level of oil. When the level of oil in the OWS exceeds 20% of the tank capacity, or 110 gallons of oil, the amber indicator will light, signifying that the OWS if full of oil. The high-level condition will remain and the amber indicator will remain lit until the OWS oil is pumped out and is re-filled with water. The OWS will continue to process oil/water even when an alarm condition is present.

4.0 OPERATION AND MAINTENANCE

The operation and maintenance procedures of the OWS system is described in the following frequency intervals:

- Monthly
- Annually
- As Needed

The operation of the oil-water separator system includes, but is not limited to, the following procedure:

4.1 MONTHLY

Once a month perform a complete system check that consists of the following activities:

1. Open the inspection port on the inlet separation chamber and verify that the liquid level in the chamber is appropriate, measure the amount of oil collected in the chamber, and evaluate the amount of sludge accumulating on the face of the coalescer pak. Contact the appropriate personnel if appreciable sludge is observed to assess whether cleaning is needed.

2. Open the inspection port on the effluent water chamber and verify that the liquid level in the chamber is appropriate. Inspect to verify that there is no oil collecting on top of the effluent water, check by using a 36-inch disposal, Teflon™ bailing tube or clean white cloth test.

4.2 ANNUALLY

On an annual basis perform the following activities:

1. Inspect for fluids in the annular space between the double containment walls of the separation vessel by making visual observations and physical measurements in the interstitial monitoring tube.

2. Review the activities performed in past year and compare to the requirements provided by this manual. Make recommendations for revision to the manual or upgrade to any part of the system. The manual should be updated as site condition or system changes occur.

4.3 AS-NEEDED

On an as-needed basis perform the following activities:

1. Remove and dispose of recovered oil when necessary. Record the date, time, and volume of oil and water removed. Re-fill the OWS with clean water to resume operation.

2. Pump out any accumulation of sludge or sediment from the inlet separation chamber using a sludge pump or vacuum truck and conveying the solids to a transfer truck. Minimize to the greatest extent possible the volume of water removed. Log the date, volume, and recycling company at time of sludge/sediment removal.

3. Remove and dispose of any sediment or debris from the inlet and outlet conveyance piping. Log the date and amount of debris removed.

4. Remove and clean the coalescer pak located in the separation chamber. Log the date and procedure used and description of build up at time of cleaning.

5. Remove (absorb) oil accumulation from the effluent water chamber (if any). Log the date and volume at time of removal.

6. Remove and dispose of any sediment from the interceptor. Log the date and volume removed.

7. Respond to all alarm illuminations, log all alarm illuminations in the log book provided, including the time, date, and volume of oil removed from the OWS.

8. Check the voltage in the two 12 volt nickel-cadmium batteries (connected in series) to verify that at least 24 volts is available to the indicator light in the event of an alarm condition. Measure the amperage supplied by the two solar panels (connected in series) to verify that, when operating at full capacity (sunny), they are supplying at least 1.40 mA to the battaeries. A periodic cleaning of the solar panels is also recommended. Log the date and results of all measurements.

9. Troubleshoot all equipment associated with the Oil-Water Separator System. Record maintenance and repairs.

5.0 HEALTH AND SAFETY GUIDELINES

5.1 HEALTH & SAFETY PLAN REFERENCE

The activities conducted at this site by Dames & Moore and independent contractors warrant health and safety precautions to be taken and a level of awareness for the companies and its employees conducting work at the site. The chemical hazards of this site primarily consist of petroleum hydrocarbons. Physical health and safety hazards at this site include, but are not limited to:

- splash of oil or waste water
- electrical shock
- heavy lifting

By raising the awareness of the health and safety hazards at the site or the oil recovery systems the risk of chronic or acute health problems and immediate injuries can be minimized.

Dames & Moore has prepared a site-specific health and safety plan for this site to include the investigation, construction, and operation activities generally being conducted. The plan, written by Dames & Moore's Health and Safety Department, complies with the Federal Health and Safety Regulations as set forth in 29 CFR 1910 and 1926. This plan is written primarily for the use of Dames & Moore personnel and the activities specific to their site personnel, however we have made the plan available to the contractors working at the site in various capacities. A copy of the plan is available to any contractor working at the site upon request, fulfilling the obligations under 29 CFR 1910.120 (b)(1) regarding subcontractors rights-to-know about general or specific site hazards.

5.2 KEY POINTS OF SAFETY PROCEDURES

The site conditions pose several general hazards that require cognizant awareness and precautions.

5.2.1 General Site

Several hazards and general precautions related to the physical site conditions have been identified, including the following:

- Warm summer weather can cause dehydration. Drink plenty of water if long exposure to the sun.
- Exercise standard care when working with heavy equipment and power tools.
- Exercise standard care when lifting heavy equipment or supplies. Use the rules of lifting with the legs bent, object close to the body, and avoid twisting. Use hoists and truck dollies whenever possible. Lift with a partner when possible.
- Exercise care in all areas to protect against slip, trip, or fall.
- Avoid working at night. If night work is required, use existing lighting or provide additional temporary lighting as needed for safety.

5.2.2 Oil-Water Separator System

Several hazards and general precautions related to the oil-water have been identified, including the following:

- Petroleum hydrocarbons generally have low flash points, meaning that an explosive or ignition hazard may be present. Avoid welding work or heating aetivities that may ignite reelaimed oil.
- Petroleum hydrocarbons are comprised of many chemical compounds; four of which may be present are benzene, toluene, ethylbenzene, and total xylenes (BTEX). Benzene is a known carcinogen (cancer causing compound) when ingested at elevated levels. However, these four compounds are unlikely to be present at elevated levels in wash rack water containing only routine oils.
- Standard care should be taken to minimize/avoid inhalation of oil fumes or ingestion.
- Exercise standard care to work with appropriate ventilation around oils.

- Respiratory PPE should not be required if general precautions are taken.
- Exercise a standard level of personal hygiene by washing your hands and face before eating, smoking, or going home at the end of the day.
- Exercise care in removing residual oil from clothing and boots prior to leaving the site, going home, or entering restaurants.
- Utilize a Tyvek (or equal) coverall or chemical resistant boots to minimize soiling personal clothing in certain situations or activities.
- Utilize work gloves or nitrile chemical-resistant gloves when appropriate.
- Splash protection is recommended for applicable activities. Eye protection from splash include safety glasses with side shields, goggles, or face shield.
- Follow the general electrical safety procedures when working with the battery and/or charging system.
- Exercise care in lifting manhole lids, coalescer packs, or any other heavy equipment. When appropriate utilize a partner or a truck-mounted lift hoist or tripod.
- In the case of fire, use water to cool exposed containers and extinguish. Use water spray for vapors. Use dry chemical foam or carbon dioxide to extinguish open flame.
- A summary of the optional PPE includes the following:

IMPORTANT!

Optional PPE:

- **Goggles or face shield**
- **Tyvek coveralls**
- **Work gloves**
- **Nitrile chemical-resistant gloves**
- **Chemical-resistant boots**
- **Ear plugs**

- Refer to the Material Data Safety Sheets (MSDSs) for products which may be present in the wash water for more detail.

6.0 TROUBLESHOOTING

The operator is required to respond immediately upon discovery of malfunctioning equipment or unusual observations during inspections.

IMPORTANT!

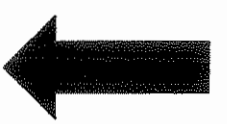
The operator is required to contact the appropriate personnel until personal contact is made.

The operator is required to document to the greatest extent possible the observations made upon discovering the problems or alarms associated with the OWS system. In instances of emergency, prioritize to complete the troubleshooting and repair first and recordkeeping second. However, use phone call updates (including detailed voice mail messages) as a form of recordkeeping.

The troubleshooting section of this O&M manual provides a general list of steps or procedures the operator may follow when troubleshooting the system. However, this section does not contain information to deal with every possible scenario. For purposes of brevity and to avoid any loss of interpretation, this section was written with the premise that the operator would review the manufacturer's manuals for the individual system components at the time a problem arises. Each manufacturer's manual contains a troubleshooting section that should be referenced during a troubleshooting event.

IMPORTANT!

The service contractor should remember to review the manufacturer's manuals presented in the Appendices during troubleshooting of the system.



1. **Amber Indicator Light** is activated.

   - The OWS oil level has reached approximately 20% of the total tank volume, approximately 110 gallons. Call appropriate personnel to assess emptying the tank.

2. **The oil-water separator** is not adequately treating the influent water to remove the oil.

- Check the percentage of oil in the influent mixture, evaluate if the volume of oil has increased.
- Check to verify excessive oil has not been collected. Excessive oil in the separator requires special recommissioning procedures.
- Check to verify the flow rate does not appear to be exceeding the maximum rate (55 gpm) of the separator system.
- Check to verify that excessive soaps or surfactants have not been introduced into the wastestream. These cleaning detergents would compromise the separation of oil causing it to remain suspended in the water.
- Check the thickness of oil accumulated in the inlet chamber accessed by the port on the sedimentation chamber manway. Record the measurement.
- Check the level of total liquid in each area of the OWS.
- Check to verify the oil level in the separator is not at a high level without the amber indicated light being activated.
- Check to verify the coalescer pak is not clogged with trash or debris.
- Check the log book to verify when the coalescer pak was last cleaned and the degree of buildup noted last time.
- Check the clean water chamber to verify an oil film has not developed. Use a bailing tube or clean white cloth test.
- Check the manhole MH#1 immediately downstream of the separator to verify an oil film has not developed. Use a bailing tube or clean white cloth test.
- Check the manhole MH#1 immediately downstream of the separator to verify it is not backed up due to clogged discharge lines or clogged sewer pipes.
- Perform a snake or water jetting procedure to the upstream and downstream pipes to ensure clogging did not occur due to rags, bottles, bags, sand, or sediment.

- Contact the technical support for the OWS manufacturer or representative to explain the symptoms and results of the troubleshooting procedures followed thus far. Provide manufacturer technical support with data collected from troubleshooting procedures followed above. Follow the recommendations of the technical support.

APPENDIX A

PHOTOGRAPHIC LOG

APPENDIX B

HIGHLAND OIL/WATER SEPARATOR USER'S MANUAL

APPENDIX C

LEVEL CONTROLS

APPENDIX D

SOLAR PANELS

APPENDIX E

AS-BUILT DRAWING

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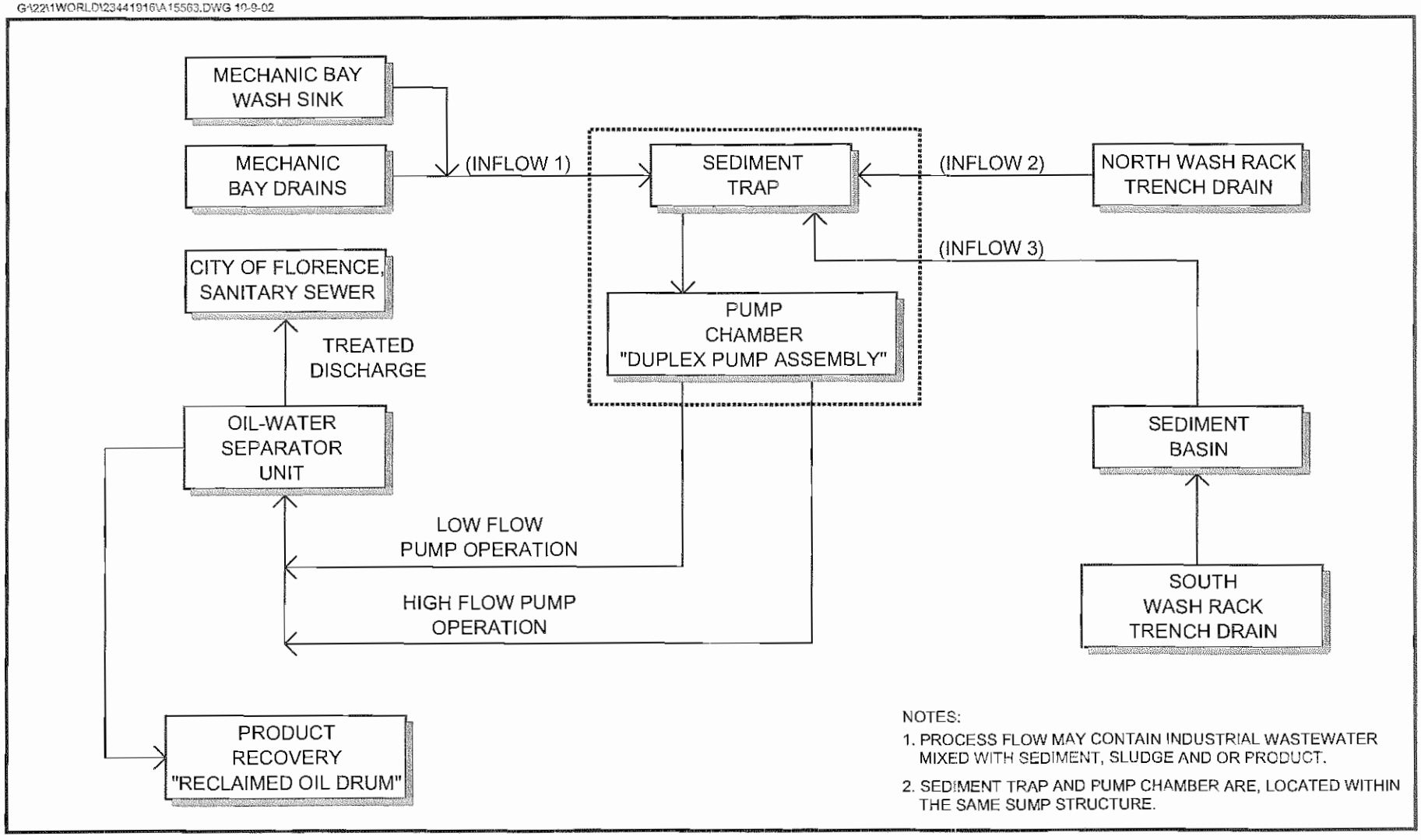

NOTES:

1. PROCESS FLOW MAY CONTAIN INDUSTRIAL WASTEWATER MIXED WITH SEDIMENT, SLUDGE AND OR PRODUCT.
2. SEDIMENT TRAP AND PUMP CHAMBER ARE, LOCATED WITHIN THE SAME SUMP STRUCTURE.

General Process Flow Diagram
Industrial Wastewater System
Arizona Army National Guard

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Figure 1